INDUSTRIAL ARTS and VOCATIONAL EDUCATION

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AMERICAN VOCATIONAL ASSOCIATION CONVENTION

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION annually devotes a goodly share of its December issue to give publicity to the American Vocational Association convention. This was again done this year and the reader's attention is especially called to the fine description on page 363 of the convention city and its fine school system. There also is a detailed convention program on page 395.

The officers of the American Vocational Association have worked hard to make the convention, which is to be held at San Antonio, Texas, December 2 to 5, a real success. It is now up to the membership to do its part. All shop teachers ought to be interested in the convention because every one of them is affected by the things for which the association stands. Now, where the trend of times points to inevitable change, it is the duty of every teacher of industrial arts and vocational education to attend this national convention if it is at all possible.

ANNUAL INDEX

A title page and index for Volume 25 of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION has been prepared for readers who bind their magazines. A card addressed to The Bruce Publishing Company, 524–44 N. Milwaukee Street, Milwaukee, Wis., will bring a copy.

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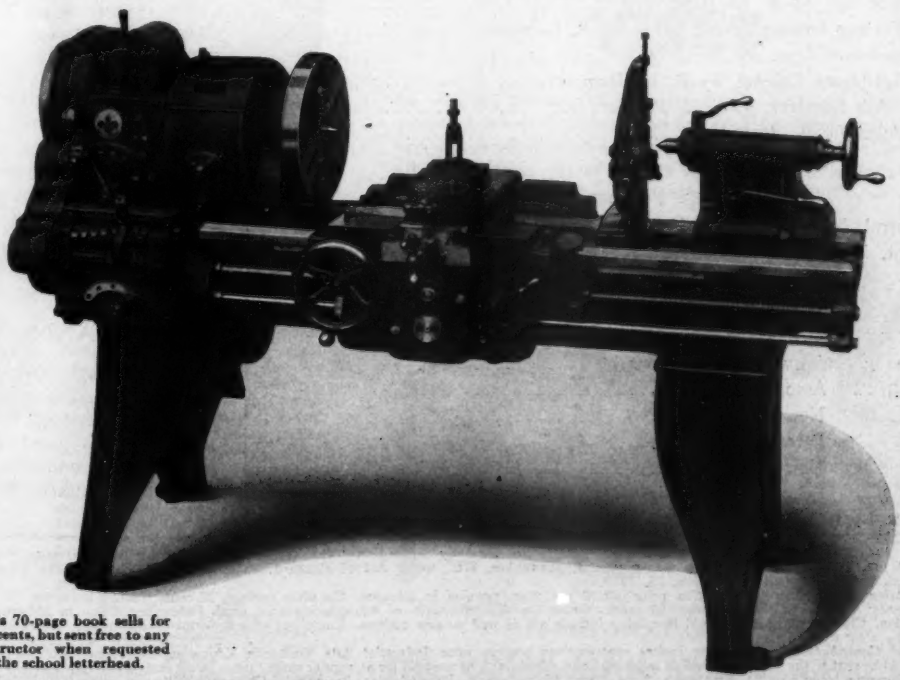
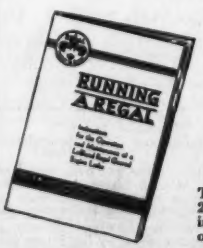




This 70-page book sells for 25 cents, but sent free to any instructor when requested on the school letterhead.

December, 1936
Vol. 25, No. 12

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

San Antonio Greets the A.V.A.

Arda Talbot Raht
Vocational and Technical School, San Antonio, Texas

Those who plan to attend the A.V.A. convention should read this article before their trip to San Antonio. Those who have decided not to go to the convention also should read it and then change their minds.

The Alamo

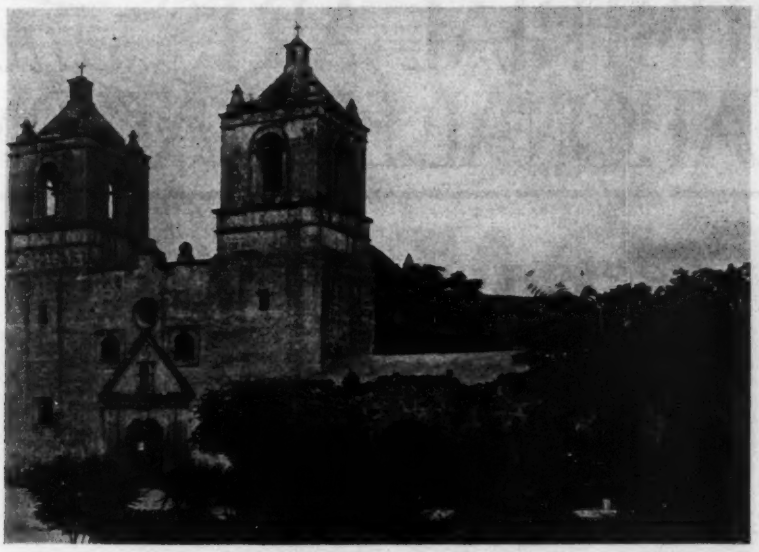
San Antonio, Texas, extends to the 1936 A.V.A. convention the hearty greeting of the West, and the courteous welcome of the South, for San Antonio is both south and west.

The city possesses a quaint Latin atmosphere which adds an indefinable charm to the delights of a sojourn in its midst. Down meandering side streets are tucked fascinating bits of old Mexico. Like oases of green in the gray of city pavements are the plazas around which flows the commerce of San Antonio. Side by side on a downtown plaza stand a towering office building and an ancient cathedral, old when Washington became president. Great, purring cars and lazy little donkeys share the streets which link modern hotels, theaters, and stores with the street bazaars in Little Mexico. Just behind the old cathedral is the governor's palace, a reminder of the days when viceroys ruled San Antonio in the name of the King of Spain. South and west of the spanish governor's palace is a colorful bit of old Mexico. Vendors of pottery, basketwork, and Mexican foods display their wares in sidewalk bazaars.

Almos Dam safeguards San Antonio

Most famous of San Antonio's parks is Brackenridge, with its renowned Japanese sunken garden; its sunken-garden theater, a great natural bowl where civic-opera performances are staged during the summer months; Witte Museum, housing the San Antonio Art League's paintings and a fascinating exhibit of by-gone days in Texas. San Antonio's zoological gardens also are in Brackenridge Park.

A half day spent at Fort Sam Houston will give the visitor an excellent conception of the activities of our War Department. It is the largest military post in the United States. It covers not



Mission Concepcion, the early home of industrial education

acres, but miles. Infantry, cavalry, and artillery are all represented, and building after building filled with military supplies stretch away over the plain. San Antonio also possesses the largest army flying field — Kelly Field. Airplanes above San Antonio are almost as common as automobiles on the streets. Practically every licensed pilot in the Army or Navy received some or all of his training at Kelly Field.

Perhaps the best known of all places of interest in San Antonio is the Alamo. This famous building faces Alamo Plaza, in which grow palms and various other semitropical trees and plants. The thrill of the Alamo touches the visitor as soon as he places foot on its floor. The very atmosphere of the place — the recollection of the deeds of valor enacted within it — quickens the blood. To stand in the small room, where Colonel Bowie lay ill when the fort was surrounded, brings the struggle for Texas independence very close to our day.

San Antonio is unique in being one of the oldest vocational-training centers in the United States and also in that she now has one of the largest and most up-to-date vocational-training shops.

Her first vocational-training work was introduced in 1716 at the five missions. Here the Indians were trained to till the soil, to prepare and cook the fruits of their labor, to weave cloth, and to do all other types of work necessary to the simple living of the missions. So successful was this training, that the missions built by their hands are still standing, and the aqueduct still carries water to the fields of their descendants just without the mission gates.

At Randolph Field, just outside San Antonio, shop training is given under conditions where there is one instructor to every eight students. No expense is spared to provide the most modern equipment in this government training school. To the visitor, Randolph Field, the West Point of the air, is a revelation in the training of aviation. The War Department has constructed a model military aviation training center,

The rose window at the San Jose Mission is considered the most beautiful piece of architecture in the United States

the largest in the world, at which all primary instruction of the army's air corps is conducted. More than $10,000,000 already has been spent, the ultimate cost to be approximately $25,000,000. Several hundred airplanes may take off within a few minutes' time. Its population is approximately 4,000. With Randolph Field, Kelly Field, Brooks Field, and Duncan Field, located adjacent to San Antonio, there is represented the largest capital investment in aviation of any place in the world.

San Antonio's Superintendent of Schools

Mr. J. Chester Cochran, superintendent of the San Antonio public schools, is essentially a vocational man. According to his belief, vocational and

J. Chester Cochran, Superintendent, San Antonio Public Schools

progressive education are so closely bound up with general education that a school system cannot be successful unless it includes all three phases.

It is under Mr. Cochran's leadership that San Antonio has established her two vocational schools. Mr. Cochran has directed a number of studies to determine the needs of and results of vocational training in San Antonio.

For the past two years, studies have been made to determine whether the high-school graduates of the previous year, who had received special trade training, were more successful in securing employment than those graduating only from a general academic course.

At present, Mr. Cochran is preparing to open a school for those students who for any reason seem unable to adjust themselves to the ordinary school training. In order to secure the necessary information, Mr. Cochran lent his influence to the making of a case study of 1,000 students of this type. He has also

assisted in the development of an experiment in the use of Scout methods for the training of the prevocational student in desirable characteristics for his adjustment to working and living conditions.

Dr. Charles R. Allen, the Father of Vocational Education, says he feels that under the leadership and conditions planned for this school, in its establishment San Antonio will make an invaluable contribution to education.

Mr. Cochran has had a variety of experience and a fine educational background. He has had experience as a classroom teacher, high-school principal, county superintendent, and president of the local junior college. He took his first degree from Sul Ross State Teachers College, and the M.A. degree from the University of Texas.

Making drawing-table stands

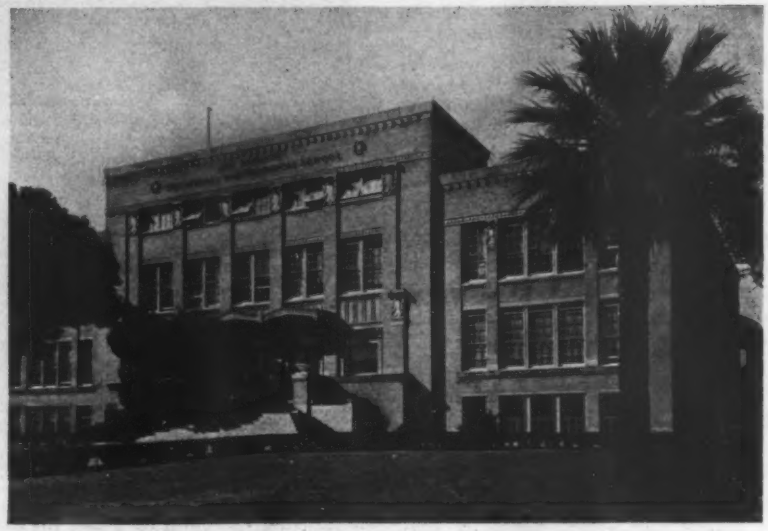
Each shop has a room for related work

He is past president of the Texas State Teachers' Association, and is at the present time a member of the Executive Committee of the National Department of Superintendence. He has also been recently appointed as a member of the Executive Committee of the Horace Mann League of the United States.

Mr. Cochran is the first superintendent in Texas to receive a five-year contract, and also the only superintendent who has ever received a second five-year contract.

The San Antonio Vocational and Technical School

The San Antonio Vocational and Technical School is the outgrowth of sincere efforts on the part of the administrators of the San Antonio public schools to give the youth of the city that training which will be best adapted to their individual and social needs. Vocational work was first introduced in San Antonio by means of a series of shop courses offered at the Main Avenue High School and the San Antonio Night School. The students trained in these courses were so successful that the employers asked to have the work extended.



One of the four buildings that make up the San Antonio Vocational and Technical School

Welding

Auto mechanics

Electricity

The first step in the establishment of the vocational school was a comprehensive survey of the industrial and the commercial situation in San Antonio. This was completed in 1929. In 1931 the plant and organization was planned to train students for positions in the local industries and business establishments as determined by the survey.

Work on the reconstruction of the plant was immediately begun. Several of the buildings were entirely remodeled, and one new building was added. The school was opened in February, 1932. The personnel of the school included 30 teachers and 600 students.

The school grew rapidly; the number of teachers has increased to 65 and the number of students to 1,400. In addition to this, there is a marked increase in the earnestness and sincerity of purpose with which the students enter upon their work.

Work in this school is divided into four main divisions: trade and industrial division, technical division, commercial division, and general education division.

The trade and industrial division includes 14 curriculums that offer training in the trade and industrial occupations.

The technical division gives partial training in not more than three of the major trade and industrial fields.

The commercial division offers training in the basic fields of the business world.

The general-education division takes

care of those students living close to the school who desire an academic-high-school course.

Problems Involved in Educating Non-English-Speaking Children

The work of curriculum revision has been in progress for a number of years in the elementary schools of San Antonio. San Antonio is a cosmopolitan city, the curriculum, therefore, is adapted to the needs of children of many nationalities and of varied environments.

The fact that more than 50 per cent of the children in the elementary schools come from homes where English is not spoken, presents the problem of developing a special curriculum adapted to their needs. Through a survey of community conditions, materials that would function in the lives of the children were determined. By means of classroom experimentation extending over a period of years, special materials and techniques were developed.

It is the schools' responsibility to turn out a civic-minded group of boys and girls who are trained for loyal American citizenship, and, if possible, for economic independence. Education for complete living is best made by giving boys and girls opportunity to live through experiences that have meaning to them, now, and to teach them to live together in mutual helpfulness; to be clean, self-respecting citizens of the school and the community. Americanism means, partly, teaching ideals of living, and of good conduct, based on a knowledge of our language, and it is best unified through a common language.

The problem of learning a new language centers in the aims: (1) the ability to communicate thought through conversation, which grows out of the vital experiences of the children; (2) the ability to acquire thought through reading, which may be a record of these experiences. The first aim is a problem of teaching the child to speak the language, and the second a problem of teaching the child to read.

Vocational training in orchestra and band work

The major problem, then, is the choice of activities which are close to the everyday experiences of the child, his interests and needs being kept constantly in mind. Through these activities, the child acquires a practical knowledge of English and builds a background of understanding for the interpretation of books. Certain social habits, ideals, and attitudes are developed which may carry over into the home. The broadening of the child's experience gives him a better understanding of his environment and enables him to carry on the work of the school normally and intelligently.

Since the aim of the work with non-English-speaking children is to enlarge their language experiences, their lack of oral background and experiences makes the task very difficult. Therefore, the work of training them to speak English must be carried on very carefully and systematically.

The results of such a program in teaching English to non-English-speaking children may be evaluated on the basis of achievement in terms of aims and purposes. The situation, summed up, seems to be that through the operation of such a program these children are speaking better English; they are developing social habits and ideals of cleanliness, courtesy, self-respect, and fair play; they are reading more books and with better understanding.

As stated by Miss Elma A. Neal, first assistant superintendent of the San Antonio school system: "We believe that in teaching the non-English-speaking children of our schools to speak English and to read intelligently, we have made possible the adjustment of non-English-speaking children to the curriculum, which is our ultimate goal."

The Brackenridge High School

Brackenridge High School is one of the four senior schools of San Antonio. It is housed in a three-story building originally built in 1916 with a capacity of about 1,800 students. Additions made during the past five or six years have increased its capacity to approximately 2,400 students with 2,127 in attendance at the present time. These additions have modernized the building rather ex-

Brackenridge High School

View of part of the mill shop at the Sidney Lanier Vocational School

tensively and made it possible to offer a broader and richer curriculum. This general curriculum embraces English and journalism, social sciences, mathematics, natural sciences, physical education, and R.O.T.C., foreign languages, commercial, practical arts, speech arts, and fine arts. Students attending this school have the privilege of selecting the various subjects upon which they propose to concentrate their efforts. The school is manned by a faculty consisting of 90 members. It is noted locally and throughout the state of Texas for the fine spirit of loyalty exhibited by its students and graduates.

The Thomas Jefferson Senior High School

The Thomas Jefferson Senior High School was planned and built to serve a two-fold purpose: First, to care for the present high-school pupils who reside in the north and northwest portion of the city, and second, to provide a high school of proper size and location to meet the future growth of those sections of the city.

Each unit of the entire building is designed to meet a particular need. A few facts relative to the most important divisions of the school are here given. These will be helpful to visitors inspecting the building.

The cafeteria is built to seat slightly more than 900 children. There are four lines from which children may be served. About twenty minutes is adequate time for serving one division of 900. This enables the pupil to have time for rest and relaxation before re-entering class after lunch hour. The cafeteria is well lighted, well ventilated, and is designed for cheerfulness and cleanliness.

The auditorium is planned to meet the needs of the school and also of the community. There are 2,000 seats. The stage is of sufficient size to accommodate large groups in choral or pageantry work. The fittings and scenery, while not sufficient for a commercial stage, are ample for school use. There is provision for motion pictures but at present no sound equipment is installed. There is a public-address system, and also acoustical treatment.

The heart of any school is the library. This is particularly true of the Thomas Jefferson School. Here the library supplants the old formal study hall so often found. There are 400 seats and space for 30,000 books. The room is situated to afford perfect ventilation and natural light.

The health-education unit is composed of shower and locker rooms for both girls and boys and a playing floor or gymnasium. The floor can be divided by a curtain so that it may be used by both boys and girls at the same time. This unit is well ventilated and is flooded with natural sunlight. The playing floor is equipped for competitive sports as well as those activities for health education.

Many schools are seriously handicapped by lack of space for outdoor play and recreation. The Thomas Jefferson has a football and baseball field surrounded by a quarter-mile running track. There are tennis courts, girls' playground, and R.O.T.C. drill ground.

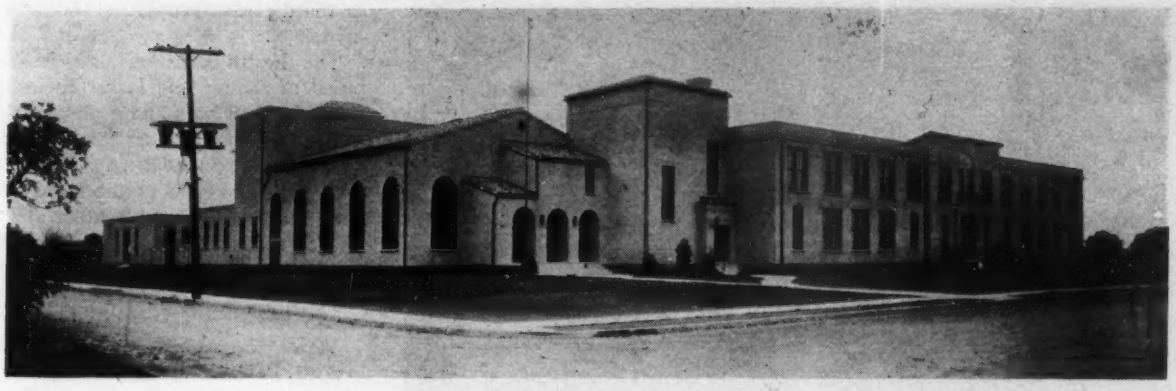
The Phillis Wheatley Senior School for Negroes

Douglass High School was probably the first building for public education of colored children in Texas. In the early seventies, the Freedman's Aid Society secured the land in the bend of the San Antonio River, North St. Mary's and Convent Streets, and out of stones from an old Confederate tannery at the head of the river, built a four-room building as a school for the education of colored children. This school was named Riverside because of its location.

The teachers were all white as no colored teachers were available in the state at that time; besides, it was the policy of the society to secure the best teachers they could for the arduous work of educating a freed people of boundless aspiration but with an unfavorable background. That these teachers were first-class in every respect is evidenced by their transfer to the white schools just as soon as the city took over the management of public education and colored teachers could be obtained to take their places. Notably among these teachers was Professor Halbedl who was transferred to the German-English school and afterwards

Thomas Jefferson Senior High School

Training for the garment industries



Phillis Wheatley School

was for many years principal of the white high school.

In the early nineties, all the city schools were renamed for illustrious Texans or other Americans. At this time, Riverside was changed to Douglass in honor of Frederick Douglass, the Negro antislavery orator and statesman.

Douglass High School has the distinction of being the first colored school in Texas to have training in the industries as a part of its curriculum. It has the best equipped industrial-arts department in the South for the general instruction of both boys and girls, as well as for the training in technical skill of the highest order.

This excellence of equipment has been recognized by the United States Government which has placed a branch of the Smith-Hughes vocational work in this school. The government maintains a staff of three instructors especially selected for their efficiency as teachers of auto mechanics, carpentry and cabinetmaking, and trade-related arts, respectively. For its girls, besides the ordinary domestic-science and domestic-arts courses, Douglass offers beauty-culture courses in the vocational field.

Douglass has always maintained a full senior-high-school course, and its graduates who have taken all of their high-school work here are admitted unconditionally into the leading colleges and universities of the nation. The Thomas Jesse Jones "Report on Secondary Schools for Negroes Education" issued by the government gives Douglass as a "thoroughly equipped modern high school," and it was the first Negro high school to be ranked as "first class" by the State Department of Education of Texas.

The academic department of the school has always been noted for its work in the literary field. Full courses in English, dramatics, mathematics, social sciences, languages, and music are taught by instructors especially trained for the work.

When the senior school was moved to the new building in 1933, the name was changed from Douglass, to Phillis Wheatley.

The school is taught by eighteen teachers, who are graduates of the best colleges and universities in America, and is housed in thirty rooms with an aggregate floor space of seven eighths of an acre. There also is a campus of five acres, on which is placed an athletic field.

The Sidney Lanier Vocational School

At the Sidney Lanier Vocational School, with its interesting curriculum, 1,500 students are enrolled, 99 per cent of whom are of Mexican descent. The first three years of the work at this school, consist of exploratory and finding courses with emphasis on health and language subjects and other practical activities. In the ninth, tenth, and eleventh grades, the program is predominantly vocational and industrial with provisions for a few select students who are interested in following the gen-

Kitchen of the homemaking department of the Sidney Lanier Vocational School

eral academic courses. In addition to the strictly vocational work, the program is enriched with such subjects as public speaking, music, arts and crafts, dramatics, home economics, and journalism. Much stress is placed upon music, and arts and crafts.

The Junior Schools of San Antonio

There are nine junior schools in San Antonio, eight white and one colored. The junior school is that portion of our eleven-year school system, comprising the sixth, seventh, and eighth grades, organized as a separate unit, and so administered and taught as best to meet the immediate and future needs, educational, social, physical, and civic, of adolescents.

The ideal junior-school teacher is a specialist in boys and girls, rather than in a particular field of subject matter. He is one who recognizes the individual differences in abilities and interests of children, and one who, in the spirit of human economy, makes wise provision for the utilization of these differences.

The junior school is committed to the idea of directed study with fundamental challenge given to each pupil. The library, therefore, used as a laboratory, is the pivot wheel of the school. The junior school is committed to the idea of many texts, rather than a single basic text. Its program of studies is based on the idea of constants and electives rather than that of multiple courses.

Sidney Lanier Vocational School

The junior school believes in expert guidance of all types in its consideration of the pupil as an individual. Extra-curricular activities are an integral part of the junior-school program. These and the courses of instruction provide an opportunity for adolescents to find life, and that more abundantly, as stated by Dr. Jeremiah Rhodes, the founder of the junior-school system in San Antonio.

Arts and crafts shop of the Sidney Lanier Vocational School

Part of the auto-mechanics shop in the Sidney Lanier Vocational School

A Threefold Invitation to the Convention

Your past presidents, Mr. Paul Chapman, from the South, Mr. Ray Fife, in the name of the West, and the President of the Texas Vocational Association, Mr. Victor Randel, representing Texas, which is both South and West, extend to you the following invitations:

To Members and Friends of the American Vocational Association:

I take pleasure in representing the West in extending an invitation to you to attend the A.V.A. meeting which is being held for the first time in the great Southwest. The West, as well as the South, regards this meeting as peculiarly its own. Professionally you should attend the 1936 convention. Two months' residence in the Southwest has convinced me that the vocational-education program of this section will have something of interest for you. From a travel standpoint, no one has seen the United States who has not visited the Southwest. The West joins with the South in bidding you welcome!

Sincerely yours,
Ray Fife, Vice-President,
American Vocational Association

To the Members and Friends of the American Vocational Association:

I am certainly happy to know that the American Vocational Association Convention for 1936 will be held in the South. Those of us who live in this section of the country have journeyed many times to other parts of the nation to attend American Vocational Association meetings. Seldom have we had the pleasure, in the southern states, of entertaining the convention. I know that all of us are delighted to have the privilege, and I am sure that no city in the entire Southland will be more interesting to our visitors, or better able to extend the hospitality of our region, than San Antonio.

Paul W. Chapman, Dean,
College of Agriculture,
The University of Georgia

Dear Co-Workers:

For the first time in its history, the American Vocational Association will hold its annual convention in the Southwest. This is a recognition of the growth and importance of vocational education in this section of the country. Plans are developing along every line to make this the most interesting, worth-while, and outstanding convention in the history of this association. We invite you to come to San Antonio, Texas, December 2–5, and urge you to begin now making your plans to this end.

Students working on individual jobs

Cordially yours,

Victor Randel, President,

Texas Vocational Association

Vocational Education

Edward A. Fitzpatrick

Dean, Graduate School, Marquette University
President, Mount Mary College, Milwaukee, Wisconsin

A concept of vocational education which must become more general if this type of education really is to fulfill its mission.

I believe that in a democratic society in which social parasitism is not looked upon with favor, vocational education is a necessity for all — whether as trade training in plumbing or stenography, or as professional training in theology or architecture. I believe with the American Federation of Labor that this vocational education in its lower levels must be not so much training for industry as training for life in an industrial society, and with the humanistic view once expressed by the National Association of Manufacturers that "vocational education is not teaching for an occupation only; it is the making of men and women." In the higher levels of vocational education, its social responsibilities, its need for social insight, ideals, appreciations are no less essential than they are in the life of those who carry on the foundation processes of our industrial society. In all levels, vocational education must not mean a denial to its votaries of the intellectual life or of a liberal culture or of a spiritual outlook on life. The danger of this denial is as real and as general in the professional school as it is in the ordinary trade school. The purpose of vocational education is beyond itself. It is for leisure — for human living. It settles the elementary problem of economic self-support for oneself and his family. It frees the individual for what Aristotle called "the rational enjoyment of leisure." It frees him for the development of his highest human possibilities.

I believe we should follow the first alternative and aim to determined by an incomplete vision of the real meaning of education and that its aims are indefensibly narrow. It is as great a mistake, on the other hand, to think that education is a white-collar thing that will save its possessor from the dirt and grime and labor and meanness of the industrial order. Education must recognize vocation as a social necessity. We shall make experience in production educative, or we shall recognize vocational experience as a kind of social evil or else negation, and aim to restrict it more and more in the individual life, purely as an educational measure.

I believe we should follow the first alternative and aim to make the production of socially necessary things an organized educational experience. It would seem almost a perverse and malign social order if men had to sacrifice themselves in loss of health, devitalization, and dehumanization, in the production of things which we all need. It would, on the contrary, be a well-ordered and benign social organization if men, in the rendering of essential social services, were raised out of the level of deadening routine, were touched in their imagination, had the vision to understand the social good they were doing. That would be truly the Great Society. In it, industry would be helpful in the spiritual formation of men. It would be educative in the broadest sense. Work would become education.

In the medieval guild and in the medieval industrial order — to which we are making no plea to return in practice (much as we should like to see a return in principle) — we saw some approximation to this ideal. Victor Branford, in his *Interpretations and Forecasts*, puts the situation with great insight into its principal asset: "They could not read and write, these craftsmen who built the cathedrals and staged and played the mystery drama. But is there in our contemporary civilization any group, even among the most cultivated classes, who, for their time and period, reach a similar level of culture — to say nothing of practical performance having endured knowledge of how the universe and our planet were made and how they work? The astronomers and geologists you answer. Who are adequately versed in contemporary views of natural and human history? The biologists, psychologists, and historians, no doubt. Who have mastered and unified contemporary theories of the meaning and destiny of civilization? At this let a few sociologists be supposed to hold up audacious hands as having a claim. But when we ask who unites the learning of astronomers, geologists, biologists, psychologists, historians, and sociologists? And who, moreover, reconciles such unified knowledge with the wisdom of priests and the intuition of women? Echo only answers *Who?* But to this level of culture the medieval citizen did practically rise, for his time and his civilization, and as craftsman he expressed its resultant in life and labor. What wonder that with such unification of resources there went an exaltation of man and his chief product — the city. In the resultant uplift, the urge of life to live to its intensest and utmost found expression in the creation of the medieval city and the flowering of its spirit in the cathedral. 'Whatever thy hand findeth to do, do it with all thy might, for there is no knowledge in the grave whither thou goest.' "[1]

[1]Victor Branford. *Interpretations and Forecasts*, pp. 231–232 (Chicago: The Argosy Book Shop, 1914).

As a matter of actual social practice — if not policy — we follow the opposite of the Great Society. Men, in the process of making and distributing things that others want or are trained to want by advertising, are depersonalized and dehumanized. We have standardized and mechanized until industry has become for a great number of human beings a monotonous repetition of a single act, day in and day out. The workman follows his blueprint. His work is not educative. It is not humanizing. It is not spiritually formative. In the world war we learned we could take men (and women, too), place them in factory schools called vestibule schools, and train them in these processes in a few days. If there was a change of process, workers could be taken off their machines and trained in their new process in a few days, too. In such a situation all we have is vocational training — but no education. And there is hardly any justification whatever for schools wasting their time incompetently on such training, for factories can do it more competently and more quickly. We must not identify vocational education with the vocational or trade training that has been described.

I believe strongly in the development of new social policies that aim to conserve the humanity of the worker. If the tendencies described develop further, then the industrial processes of our society are a necessary evil, and human beings should spend as little time in them as possible. Here is the educational basis for the five-day week and the six-hour day. But all labor or work need not be of this character; we trust our social leadership will recognize that.

Human labor is not a commodity. It is no part of the merely dead materials of industry. It is no part even of the wonderful automatic machinery of modern specialized industry. Its precious life must be conserved. Its potentiality for education must always be uppermost for the individual in the guidance of his own life as well as by the government and industry in its social aspects. The human being is an end, not a means — either for government or for industry.

I believe that the ultimate purpose of industry as of all social machinery is to make better men and women, whatever its proximate end — bathtubs, furniture, food, carpets, farm machinery, or what not. Even for its more immediate object — the making of things — it would be more successful if it kept in mind and was guided by the humanistic point of view.

I believe in that social and human viewpoint of vocational education which takes the problems of modern industry into the classroom to be studied, not only from the viewpoint of mere industrial efficiency, but also of the welfare of our industrial society. This means that the fundamental economic, social, political, scientific, and cultural elements in the curriculum shall grow out of the fundamental industrial core.[2] This does not mean that economics, politics, science, history, and other subjects will be subordinated to industry, but that industry shall furnish the motivation in these subjects, and they shall ultimately reach the logical formulation that is the mature result of the study.

I believe that between a genuine liberal education and a genuine vocational education there is no essential difference. The difference is a difference of material — one has at its center the vocational material, and the other, the cultural materials of our civilization. The human and social results should be the same. The contrast, conflict, and dualism of these two come from contrasting liberal education and vocational training or trade training. These will often be narrow and without educational significance. As carried on in the school, they are usually not effective. A short experience in the factory, or in the vestibule school to the factory, will be more efficient and save endless futile hours for real education.

"A nation which regards education *primarily* as a means of converting its members into more efficient instruments of production is likely not only to jeopardize its moral standards and educational ideals, but to discover that by such methods it cannot attain even the limited success at which it aims."[3]

I believe that the selection of a job is an election of a life. We decide not merely our economic activity but a pervasive influence in every aspect of our life. Vocational guidance must not be educational Calvinism. It must discard social predestination from its vocabulary as well as from its conception. Vocational guidance must be educational guidance. As principles, we may accept the principles of the National Vocational Guidance Association.

I believe that vocational education is education. The whole range of liberal, humanistic, and spiritual ideas must inform it. It is a mistake to think of a liberal education being finished and a vocational education as being something superadded. Vocational training or any training for mere skill is admittedly narrow, but vocational education from the lowest to the highest professional training should be informed by the purpose of a general or liberal education. It must continue to be concerned with education. Its purpose, as indeed the purpose of industry, is to make men.

[2]Dewey's *Democracy and Education*, p. 372: "An education which acknowledges the full intellectual and social meaning of a vocation would include instruction in the historical background of present conditions, training in science to give intelligence and initiative in dealing with material and agencies of production; and study of economics, civics, and politics, to bring the future worker into touch with the problems of the day and the various methods proposed for its improvement."

[3]*Readings in the Philosophy of Education*, E. A. Fitzpatrick and J. P. Treacy (New York: D. Appleton-Century Co.).

Training Youth to Meet Its New Needs

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A statement of the problem and a method for solving it indicated.

When we snap on the electric switch to flood a room with light, we tap all of the intricate mechanism of the modern power plant — and huge turbines, heavy cables, and miles of wire, leap to do the bidder's will.

We have a similar analogy in the classroom teacher who provides the point of contact between the educational machinery on the one hand and the student body on the other. School plants, teaching devices, materials and the varied phases of educational administration are not ends in themselves but only a means to an end. That end involves the influences of education to bear on youth through the medium of the classroom teacher. The activities that take place within

the confines of the classroom largely determine what education shall mean to boys and girls.

It is the classroom teacher who meets at first hand the fundamental and essential problems of education. These problems are human problems that expand themselves into interrelationships with others. The slowly evolving science of education has one valid purpose — to enable the teacher to practice the art of teaching with more satisfaction to himself, and with more enduring results or consequences in the lives and thought processes of boys and girls.

For purposes of comparison, let us glance back to what the school had to offer 35 or 40 years ago. At that time, child labor prevailed. Today we can say it is abolished, and it almost seems as if there were no place in industry for the youth of our country under 20 years of age. As a matter of fact, the compulsory school age has been raised four or more years within a comparatively short time.

Then, fewer than 10 per cent of the pupils of secondary-school age were in school. Today 60 per cent of all children up to 18 years of age are enrolled in school, and the other 40 per cent should be.

From 1830 to 1920, the number of secondary-school pupils increased to 2,500,000. In the next ten years (1920–1930), it doubled. Since 1930 there has probably been another increase of 40 per cent.

Then, the high school was a select shop. There was no intermediate or junior high school. We tried to fit the child into a rigid formal program. Failing in that, we "saved our standard" and eliminated the child. Today with the intermediate school beginning with the seventh year, there are many courses open to the pupil, and the effort is now to fit the school to the child.

Then, the program was purely academic. Practical-arts shops and homemaking laboratories were not included in the plans for a new building.

Then, the only music taught was general school chorus singing. Today, we have marvelously developed bands and orchestras, choirs and choruses, even in the junior high school.

There were no intelligence or scholastic-aptitude tests. Standards were arbitrarily set, and pupils who survived, reached these standards. Each pupil's achievement was just as high as the teacher declared it to be. Standards varied widely, and the failure of students was tragic.

Then, there was no guidance program. Today pupils receive many types of help and guidance.

Then the extracurricular program was narrow, and limited practically to activities of an athletic nature or such things as a "spell-down." The curriculums, also, were few in number and rigid in character. The report of the committee of ten was the bible of high-school principals in those days. The basis for curriculum construction was subject matter. Today, there are many curriculums, flexible in character, organized on the basis of pupil needs.

In all of this, there was in the past, the underlying philosophy that it was our duty to select the fit and to train them for leadership in a democracy. The theory being presumptuous, we had to discover that the best way to discover leaders was to let them discover themselves in a situation where everyone has a fair chance.

If all this has been changed to the point with which we are so familiar, it may be asked "What more is there to do? Isn't this good enough?" To this we must answer, "There is still a great deal more to do in the training of our youth." We are confronted and challenged with the problems associated with the greatest social, economic, political, and religious unrest that the world has ever known.

The Michigan Council on Education states the problem for youth as follows:

1. Unemployment is causing great maladjustment among young people. Even when employment is available, it is often carried on under conditions which are demoralizing to the personality and ambitions of youth.

2. The vocational outlook for youth is rapidly shifting and practically unpredictable, because industry needs only a portion of the available youth on account of improved technological and productive processes.

3. While young people do not in the main want to loaf, loiter, and roam, there are enormous numbers of wandering youths. (A very enlightening book on this point is *The Boy and Girl Tramps of America.*) The CCC Camp program has benefited many, but it is not a complete solution, for it takes youths out of their communities and isolates them from chances to contact vocational opportunities.

4. Youth finds itself with an unprecedented amount of leisure and is not trained to use it intelligently. It has little preparation or opportunity for creative use of leisure in crafts, dramatics, hobbies, social recreation, and the arts. (However, the Allied Youth Movement, the Future Farmers of America, the Future Craftsmen of America, and other organizations will do much to meet this problem.)

5. The schools with their emphasis on formal education are not yet geared to help youth live well in the world as it is. The vocational program of the school needs to be enlarged to include the total vocational life of the pupil and the necessity of vocational adaptability.

6. Attendance at school has not adequately equipped youth to keep abreast with the times, to understand current affairs, and the changing social and economic conditions of our country, not to mention world conditions.

7. The home life of many youths is frequently filled with tensions produced by the economic and social readjustments of the parents as well as by youth's own peculiar difficulties.

8. The necessity for deferred marriage for many older young people is a serious problem, leading in many cases to a sense of hopelessness regarding the possibility of marriage, and as a result there is increased immorality.

9. Many young people have developed attitudes of hopeless dependency, blind resentment, or calm acceptance of government relief at an age when there is special need for initiative and resourcefulness.

With the problem stated, we may ask, "What can we who are interested in industrial arts and vocational education do to help solve the problems of youth?" It would be a difficult task to enumerate a complete list of specific things that we could do, but we should have a thorough understanding of the problem as a whole, and then, whatever we do, try to fit ourselves into the activities of our local communities.

Much already has been done in the way of a start, from the national government down to local situations. The secondary school has come to stand as the only organized public agency to which the parent may turn for the solution of the problem of what to do with the unemployed youth. Because of this and because of the faith of the American public in education, there has been, as has already been stated, a tremendous increase in our secondary-school enrollment. Included in this increase are the children belonging to what is commonly known as the lower economic and social groups, so that today the secondary-school population more nearly approximates a cross section of our society than did the highly selective high school of a few years ago.

A disturbing factor to secondary-school people is that while

the public has entrusted them with from 50 to 80 per cent of all the adolescents, it is becoming very critical of the traditional high-school program.

We are challenged by such questions as: Has the school no responsibility for character training, honorable citizenship, unemployment, and crime prevention? Do we not tolerate corrupt politics by persons who are the products of our public schools? After all, what is the vocational and the social significance of the subjects that are offered in our high schools?

Professor Lowell Carr, of the University of Michigan, says that "No child is born delinquent." If this is true, why does 1 per cent of the population of the United States between the ages of 10 through 16 go through the juvenile courts annually?

It is pretty generally agreed that a busy child seldom gets into difficulty. Here, then, is a place where we as teachers can do something. I am glad to say that many communities are already doing a great deal in the way of leisure-time activities. Practical-arts education, as it develops, should do much to prevent and cure delinquency.

The criticism of vocational education most frequently heard is that "it doesn't really turn students into printers, bookkeepers, machinists, stenographers, woodworkers and other artisans." To this we might retort, "neither does a college make doctors or engineers of its students." It takes a long period of internship in a hospital before the graduate of a medical school may "hang out his shingle." Very few graduates of our engineering schools earn their salt the first few years. It usually takes years of experience before our college graduates become of great value to their employers and to society. I think we would agree that fundamentally vocational education provides the technical knowledge and develops the basic skill which is required to assure success in any employment in which the future citizens with the desirable personal habits, social attitudes, and personal abilities might engage.

Industrial arts is a part of an integrated plan of general education for complete living. The late Superintendent Bogan, of the Chicago Public Schools, said, "The normal child is hand-hungry, and is curious to learn the how and the why of things."[1] Modern industrial society needs broadly educated men. Therefore, all work should be geared into the social and economic life of our people.

A change in the name of educational progress has taught us that instead of teaching skills alone as we once did, we should stress technical, social, and economic information along with the construction of a project. If the practical arts are to be worth while and indispensable experiences for youth, they must, first of all, provide an interpretation of our industrial civilization.

If the industrial-arts teacher is adequately grounded in the social and economic problems of our country, he is better able to interpret industrial processes and organizations, and to teach the function of tools and materials. It has been demonstrated long ago that an adequate knowledge of our industrial society cannot be obtained through the ordinary classroom instruction but must be supplemented with the actual handling of "things," by visual imagery, and through social adaptation and organization peculiar to the school shop.

Further, if the school in the new program of general education, is to give attention to the recreational and creative values of life, the industrial arts are surely adapted to assist in this undertaking. They provide an opportunity for the pupil to exercise discrimination in the selection of materials of construction, craftsmanship, and design, besides providing exercise for the creative impulse.

When we are considering finance we consult the investment broker; legal differences take us to the lawyer; illness calls the doctor; in all of these we follow the advice of the expert. Education has its experts who unanimously agree that industrial arts and vocational education are an absolute necessity in a well-balanced program of education.

All vocational forces have an enormous responsibility in the guidance of the millions of young people who are about to take their places as citizens of our country. There are about 29 million in all, with 10 million living on farms and in small villages and not attending any school. In a few years all of these will be forming our most important social unit, the family. What do they know about family responsibilities or citizenship? What chance have they had to learn? What did their parents before them know? How can we hope to have good citizens in a community, state, or nation when there has been little or no training for worthy home membership? Are we going to stand by and let the present generation be a repetition of the one that came before? There are such problems as health and sanitation, civic responsibilities, use of leisure time, political and economic problems, ideals for citizenship, educational and character-building responsibilities, that should be shaped in the minds of these young people, or their children will be like the generations before.[2]

The teacher is responsible to several types of society, each with perhaps a different shade of opinion concerning controversial questions. His responsibility is to appraise what has been accomplished and what is being done. His criticism should be neither destructive nor constructive, but judicial. Judicial criticism is a presentation of the truth, without prejudice toward either side of a controversy. Dr. Kilpatrick says, "If teachers continue to avoid controversial issues, we shall bring up another generation of economic illiterates."

It is predicted that in the next few years we shall see industry, business, commerce, and transportation increase to a point higher than we have ever experienced. And schools will follow in the wake of business. It will be the greatest prosperity we have ever had.

Our advances are far from regular. Thus, we may advance technically and lag mechanically; then we may advance mechanically and lag socially; we may advance socially and lag educationally; then advance educationally and lag morally. The American system, however, is one that exerts all of its forces, and over a period of time, advances as a unit. We may expect great future advances as a unit, in our educational system, and industrial education will play its part. The teachers of industrial arts and vocational education will be challenged. They will be expected to carry their share of the load in the name of progress.

Now, by way of a summary, it should be obvious that the all-important thing at the present time, is co-ordination or "teamwork." There are many organizations, agencies and institutions in our communities carrying on work with youth. Much of the effectiveness of these agencies is lost in their failure to co-ordinate their activities and co-operate in the

[1] Address before the Industrial-Arts Section of the American Vocational Association in Chicago, December 4 to 7, 1935.

[2] "Vocational Education in a Social and Economic Program," Walter D. Cocking, *A.V.A. Journal*, September, 1935, p. 53.

use of physical equipment, personnel, and program. The first and most important need is to set up the machinery for co-ordination.

The effort must be to reach the total personality of the boys and girls involved. Knowing what we do of the nature of growth and development, we cannot say that the function of the school begins here and ends there; the agency here and there; the church function somewhere else, the home still another place, and so forth. If we are to make effective our philosophy about the development of well-integrated personalities, we must practice integration in educational effort.

The present state of youth demands that layman and professional educator give serious thought to forming a constructive program which will meet four requirements:

1. A longer period of schooling for a larger percentage of our young people.
2. More liberal provision for wholesome recreation in all types of communities — rural as well as urban.
3. The development of increased occupational opportunities, especially in those kinds that have educational value.
4. The greater use of the abilities and capacities of youth in organizing and carrying forward undertakings in our communities, through the several civic, social, educational, and religious organizations.[3]

A teacher will have to be well grounded in the fields of economics, sociology, and life's problems, besides having mastered his line of special interest. He should always be the type of person who is willing and anxious to keep abreast of the times educationally, fully informed about the fluctuating labor market, trends in industry, and with the ever-changing programs of vocational training.

Since all youth need guidance, and since young people have courage and initiative while older people have experience, a partnership between youth and adults is the best solution of co-operative effort.

Youth has been faced by educational blockage, vocational bafflement, and postponed marriage, but these obstacles will not always exist. Boys and girls, gravely troubled, are asking, "Is there any use of preparing ourselves? Will there be a place for us?" They should be answered, "It will be very much worth your while to prepare yourselves carefully. He who is fitted best is needed most." And everyone who has prepared himself will find his place in the work of tomorrow.

[3]Dr. J. B. Edmonson, *The Need of Community Action to Aid Youth.* Delinquency News Letter (Univ. of Mich.), August, 1935.

General-Shop Organization

James C. Jenkins

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A method of enlisting the student in the routine work of the school shop.

The general-shop organization herewith described has been found very helpful in the Clinton Junior High School industrial-arts department.

There are approximately sixty boys enrolled in the five general-shop classes. Each class is organized on a rotation plan of six weeks each in woodwork, drawing, and electricity.

At the first meeting of the class a general description of the class organization and course content is presented to the students.

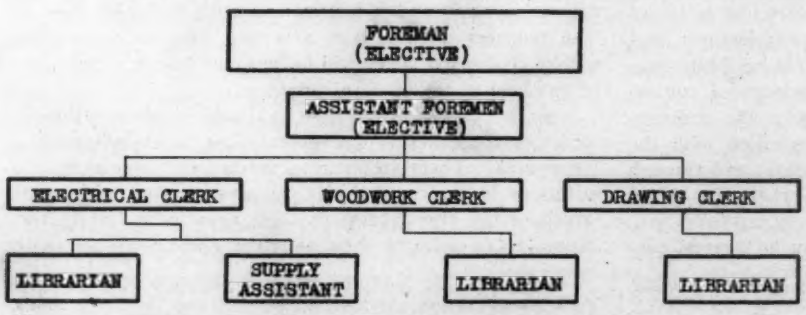
The boys are made to feel that the entire success of the class rests in their hands. To follow this idea through, a class election is next held to fill the positions of shop foreman and assistant foreman. Four boys are nominated by the class for these positions.

A class election, by secret ballot, is then held to determine the two who are to serve. This procedure stimulates an interest which, if properly followed up, is a great factor in the success of the program. The term of office is not to exceed six weeks for any one person. At the regular time for the rotation of activities, all positions, elective and appointive, are changed, thus allowing many students to participate in the organization. Great emphasis is placed on the importance of these jobs and the responsibility involved, and the qualities of good scholarship, character, and leadership are stressed.

The foreman is told that he will be held directly responsible to the instructor for the manner in which his subordinates perform their assigned routine duties. He is made to feel that he is at the head of the student organization. His assistant, whose major activity is the care of the toolroom, is next in relative importance.

It is best to start the semester with the most capable boys in the group holding those positions around which the entire routine order revolves. As the work progresses and the duties become fixed in the minds of the class as a whole, it is possible for a weaker student to hold these positions with very little noticeable change in efficiency.

After the election of the foreman and assistant foreman, the instructor appoints a clerk and a supply assistant for the electrical unit. The first principal duty of the clerk is to check the contents of each tool box as it is brought from the toolroom and to check it again before it is returned. The second duty, in which he is aided by the supply assistant, is to keep supplies distributed to the boys as they are needed. The third duty is that of accounting for absent members of the group working upon the



Diagrammatic scheme of student class organization

electrical unit. This report of absentees is given to the foreman as he passes with the class-attendance sheet. The clerk is held responsible for the selection of the librarian for his group. The duty of the librarian is to secure an account of all lesson sheets and all reference books checked out and in by the students engaged upon the electrical unit. The instructor next explains the use of the lesson sheets, and gives the first demonstration, followed by the assignment. All of this information is given to the entire class. It has been found by experience, that interest from the group, as a whole, can be maintained with little extra effort, if the students do not know who is to be assigned to the particular activity being explained, until all details have been given out.

All students now know what is expected of them if they are chosen by the instructor to spend their first six weeks in the electrical unit. The names of those boys whom the instructor wishes to remain in that particular activity are then read. He then assigns locker numbers to them and they take their positions along the benches, two boys at each numbered working place. The metal tool boxes in which are kept all tools necessary for this group are then distributed to each working place. The course is so arranged that two students can use one box. Each of these boxes is numbered corresponding to the numbers of the working places. This feature simplifies the checking of each box in and out of the toolroom and also makes the task of tracing irregularities or missing tools a very simple matter.

The instructor next assigns a locker number to each working pair corresponding to that of their working place. He then gives a demonstration of the first electrical job. The use of the lesson sheets is explained and the members of the electrical group start in to work.

The instructor then moves on with the remainder of the class to the woodworking unit. Here again a clerk is appointed by the instructor who, like the electrical clerk, is responsible for the selection of a librarian. He must also follow the plan previously described for the checking of attendance. His principal duty, however, is to see that the members of his group secure the tools at the beginning of the hour which they will need for that particular day's work. This is quite essential since the assistant foreman, whose duty it is to check tools in and out of the toolroom, will not remain in the toolroom longer than five minutes at the beginning and end of each hour. This is necessary so that he can carry on his regular classwork in the unit to which he is assigned.

After material is issued to the woodworking group, the boys are ready to begin their activities. The instructor moves on with those remaining students to the third activity, drawing.

The nature of the work in drawing is described and the methods of procedure outlined, accompanied by a demonstration on the use of tools and the operations involved in making the first place.

The drawing clerk is appointed, whose principal duty it is to secure the tools and supplies for the boys in this unit. Like both other clerks in the shop, he must report the condition of his equipment and check the attendance in this group. As in the other activities, a librarian is chosen by the clerk.

Upon leaving the drawing group, the instructor begins again and continues to move from one activity to the other, inspecting, grading, and giving individual instruction. The following demonstrations automatically schedule themselves according to the speed of the best students in the various groups.

Short comprehensive tests are given at frequent intervals. These, however, are not usually given until a definite, predetermined point in the work has been reached.

Some may doubt the value of such an organization, but to me it seems very essential. With this setup, the instructor can check individual performance of the students much better and he can spend much more time on real instruction than by any other method.

The opportunity for leadership which the boys so eagerly assume and so wholeheartedly carry out is in itself a most outstanding feature of this program. With the change of all positions, both elective and appointive, each time the class rotates from one activity to another, almost everyone has an opportunity to function in some sort of more or less responsible position in the organization each semester. This tends to make each student feel as if he personally has contributed his share toward the success of the class as a whole.

Safety Precautions in the Millroom

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An article on safety by a man who does not believe in danger signs.

The following precautions for machine woodworking have been developed out of many years of experience as a teacher of this subject. The precautions may be thought of as safety precautions for the operator, his associates, bystanders, and for the machines and stock being run. An attempt has been made to make the precautions positive and to have them help the operator develop respect for the machine that he is operating. The shop in which these precautions were developed and are in active operation has been running, under the direction of the writer, for sixteen years without a major accident. There are no danger signs in the shop, no don'ts, no suggestions to build up a psychological complex in the mind of the operator that the machine is dangerous and that he may get hurt.

The precautions are not complete or perfect. There will be found some duplications of precautions from one machine to another. This is very true in the case of machine lubrication. All of the machines treated are in this shop. Some of them have been running since 1917 and the remainder since 1920. They are all in good running condition today. The precautions are given below just as they are handed to beginners in machine operation.

1. General Precautions

1. Avoid leaning on a machine while idle or talking to someone.
2. Avoid running, jostling, or any other horseplay in the shop.
3. Keep the eye on the cutting part when operating the machine.
4. See that the machine is clear and ready for use before turning on the power.
5. Avoid trying to run short or other-

wise dangerous stock through the machine.
6. Avoid overloading the machine by trying to take a cut that is deeper than the power will pull.
7. Avoid using saws, blades, or other cutting parts that are dull.
8. Avoid talking to a machine operator while he is running a machine.
9. Avoid talking to anyone while you are running a machine.
10. Stand clear of possible flying parts while operating a machine.
11. See that the machine has sufficient oil.
12. Avoid running used stock that may have nails in it through the machine.

2. Universal Saw

1. Push the switch lever as far as it will go forward and pull the starting-box lever back as far as possible in starting the machine to avoid blowing fuses.
2. Be sure that the saw wanted is in position just below the top of the table before starting the machine.
3. Raise the saw only a small fraction of an inch above the thickness of the stock in both ripping and crosscutting.
4. Lower the saw below the top of the table when you are through with it or when you are making changes in adjustments.
5. Lock the handwheel screw when you get the saw in the vertical position that is desired.
6. Lock the sliding cut-off table in position when you are through with it.
7. Fasten the gauge rod securely to the cut-off fence and the stop securely to the gauge rod when cutting stock to exact length.
8. Stand to one side of the saw and never directly behind it when operating it.
9. Keep all loose stock, scrap, and blocks off the saw table.
10. Do not allow the blocks and other scrap to get into the exhaust system.
11. Keep the hands at a safe distance from the saw. Use the pusher when it is safer to do so.
12. Avoid pulling the stock through the saw when off bearing. Let the man behind the machine feed it into the saw.
13. See that the exhaust fan is on when you start the machine.

3. Jointer

1. See that the machine is in the proper adjustment before trying to joint stock on it.
2. Avoid running the hands over the jointer blades with the stock on knotty or thin stock.
3. Keep the guard in the proper position.
4. Avoid trying to run short or otherwise dangerous stock.
5. Set the fence as near the operator as the width of the stock will permit.
6. Avoid taking a cut that is too deep. About ⅛ in. should be about the maximum cut on a face.
7. See that the exhaust fan is on when you start the machine.

4. Surfacer

1. Avoid running short stock through the machine. The stock should be long enough to catch simultaneously on both the infeed rolls and outfeed rolls as it is fed through.
2. Avoid a cut that is too heavy. About ⅛ in. should be the maximum cut on most machines.
3. Run stock that is approximately the same thickness together when a solid feed roll is used. Start with the thickest stock in the batch.
4. Stand to one side when the stock is going through.
5. Avoid letting the stock double and get hung as it is leaving the machine.
6. See that the fast-running parts of the machine have plenty of oil.
7. See that the exhaust fan is on when you start the machine.

5. Mortiser

1. See that the bit and chisel are properly set and secured in the machine before starting it.
2. See that the bit and chisel are sharp.
3. Fasten the stock securely with the clamp before making the cut.
4. See that the bit and chisel will clear the table in the downward position before making the cut.
5. See that the bit and chisel will clear the stop fence.
6. Set the stock so that it slips under the stop fence. Never place a block behind the stock.
7. See that the machine has plenty of oil.
8. Start your operating at a slow or medium speed feed.
9. See that the bit clears the chisel about 1/16 in.

6. Band Saw

1. Avoid standing behind or in line with the blade when the machine is not completely guarded.
2. See that the guards are on before operating the machine.
3. See that the saw is brazed straight and smooth.
4. See that the machine is properly oiled.
5. Avoid overloading the machine.
6. Adjust the guide so that the teeth of the saw project well behind the guide jaws, but so that the back edge of the saw is running against the face of the guide wheel.
7. Avoid straining or bending the saw in trying to make curves that the saw width will not clear.

7. Belt Sander

1. Adjust the table so that the top face of the stock being sanded will be about 1 in. below the sand belt.
2. See that the belt is glued straight.
3. See that the machine is adjusted so that the belt will run straight.
4. Avoid letting parts of your body come in contact with the sand belt.
5. See that the machine is well oiled.
6. Run the sand belt straight out over the ends of the stock.
7. Avoid sanding too much in one place.

8. Shaper

1. See that the blades are sharp.
2. See that the blades are fastened securely.
3. Keep the guard on when operating the machine.
4. Avoid taking a cut that will overload the machine. Take two cuts if it is necessary.
5. Run the stock slowly when finishing across the ends.
6. See that there is a shoulder or fence for the stock to run against.
7. See that the machine is properly oiled.
8. Avoid getting the hands too close to the blades.
9. Avoid getting the hands and face in line with flying splinters.

9. Lathe

1. See that the stock is properly secured between centers, to the faceplate, or in a chuck.
2. See that the lathe tools are sharp.
3. Avoid taking a cut that is too deep.
4. Avoid running the machine at a

speed that is too high for the work that is being done.
5. See that the machine is properly oiled.

10. Universal Grinder

1. See that the blade is secured to the carriage with the edge in the proper position with relation to the edge of the carriage.
2. See that the blade and anchor bolts clear the stone before turning on the power.
3. See that all adjustment screws and nuts are tight before starting the machine.
4. See that the setup is made with the proper bevel on the blade.
5. See that the machine is properly oiled and that the stone has the proper quantity and quality of oil.
6. Avoid standing in line with the stone where it slings oil.
7. Keep the block pushed down on the stone to take off the surplus oil.
8. Raise the blades a little before stopping the carriage, to avoid grinding too much in one place.

Grading Mechanical Drawing

Stanley S. Radford

Engineering School,
Michigan State College,
East Lansing, Michigan

A system of grading which may be found very helpful.

While there is agitation in some places to do away with all "grades," it is nevertheless true that "marks" do furnish "incentive" to students to do better work when determined fairly and objectively. Even if the grades as given out on report cards were to be eliminated, the individual teacher is still faced with the necessity of devising some kind of "measuring stick" to rate or judge individual differences of students as to quality and quantity of work and their character as to citizenship.

To date, the letter-grading scale most universally used, A, B, C, D, E, seems to be the most convenient "measuring stick" yet devised for use by the individual teacher. *The problem is to obtain a more objective method of using this "measuring scale" by all types of teachers.* This article indicates a point basis which conforms to this "measuring scale" and which should be helpful to all drafting teachers who are interested in improvement of this most vital phase of their work in determining individual student worth.

A Point System of Grading

The writer has used the grading system herein described for several years in the Arthur Hill Trade School drafting department. It combines the A, B, C, D, E scale of letter grades with a point system of grading job assignments. In his opinion, this point system of averages consistently works out fairly for students of all degrees of ability. Students who are "academic minded" often show up superior as to the knowledge grade attained, but their technique or skill in layout of the drawing may or may not be of a superior grade. This system does not penalize the student who has a good grasp of the knowledge involved, but is poor in execution of drawings. On the other hand, the student who is slow to grasp subject matter is stimulated to develop this ability in order to make a higher job grade.

In this system, the letter grades are given the values commonly used, i.e.: A, high; B, above average; C, average; D, below average, and E, low.

All students, regardless of type or ability, need to be thoroughly impressed as to the necessity of good citizenship. *The averaging-in of a citizenship mark*

No. 4

JOB RECORD CARD

MECHANICAL DRAFTING DEPT.

Student's Name I. M. Accurate

Date Started 9/14/36 Date Completed 9/15/36 Total Job Time 3 Hrs.

POINT BASIS OF GRADING

1—Av. Knowledge Mark B+

a. Study Assignment No. 4 Time hrs. ½ Text by Jones

b. Lesson Questions No. 1-10 Time hrs. ¾ Mark B+

c. Tests—

No. — Kind — Mark —

No. Kind Mark

2—Av. Technique Mark B

Note—Check type of problem or problems completed on this job and fill in blank spaces except those for marks.

a. Drawing ✓ b. Tracing c. Sketch d. Notebook

No. C-3 Name Rocker Arm Time 1¾ Mark B

No. Name Time Mark

No. Name Time Mark

No. Name Time Mark

3—Av. Citizenship Mark B+

Note—Leave blank for instructor to check or insert marks.

a. Attitude b. Cooperation c. Honesty d. Initiative

4—Av. Job Grade B+

Note—Determine by averaging points 1, 2, and 3. This blank form must be obtained from the checker when beginning a job and must be returned to him properly filled in upon completion of the job for checking and grading.

Checker's Remarks: Strive for increased accuracy in layout.

Checked by R Date 9/15/36

Fig. 1. Job record card

on each job constantly brings a realization to the student that this point is just as essential to his success on the job as either the knowledge or technique which he possesses. A student may fail in his first job after graduation from school, because of a poor attitude, lack of co-operation, honesty, or initiative. While many other qualities could be listed under citizenship, the four points as given on the sample job record card shown in Figure 1, were chosen to rate a student as to citizenship.

A study of this job-record card shows that provision is made for grading all types of job assignments, that considerable flexibility is allowed the instructor or the checker doing the grading in that one, two, or all of the points *a*, *b*, *c*, and *d* under each main point may be graded and averaged to determine the average point grade on (1) knowledge, (2) technique, and (3) citizenship.

Determination of Average Job Grade

For example, in using the job-record card, the instructor asks the student to fill in the time spent on a study assignment to the nearest quarter of an hour, point 1-*a* on the form. This encourages all types of students really to study the assignment instead of briefly glancing through it and makes them more time-conscious. The instructor may then ask the student to write out the answers to 10 or 12 questions related to the job, or contained in the job assignment. This questior work is best handled by requiring a student to keep a loose-leaf notebook, and letter in the answers neatly in lower-case or upper-case lettering as preferred. These questions should be checked and graded at time of completion and the grade inserted opposite 1-*b*. Some instructors may prefer to give tests at frequent intervals on type jobs, instead of using lesson questions with each job assigned. In this case, the test mark is placed opposite 1-*c*. Any one of the 3 points *a*, *b*, or *c*, or all of them, may be averaged to obtain the point *1 — Average Knowledge mark.*

In a similar manner, provision is made for flexibility in assigning problems coming under point *2 — Technique mark.* The job assignment may include any one or all of the points *a*, *b*, *c*, and *d* under point 2, namely: a drawing, tracing, sketch, or a notebook sheet which may involve lettering, sketches, computations, reference data, reference drawings, tracings, and the like. Provision is made for grading several drawings on the same job as would be necessary in case of an advanced project involving several sheets of assembly and detail drawings. An average of the marks placed opposite each drawing, in case there are several drawings on the job being graded, determines the point *2 — Average Technique mark.*

The method of determining the citizenship mark according to the 4-point basis *a*, *b*, *c*, *d*, is largely left to the judgment of the instructor or checker who may grade on any one or all four points if it seems desirable. As a time-saving method, all 4 points may be given one grade directly opposite point *3 — Citizenship mark.* The writer has found by experience that, provided the attitude, co-operation, honesty, and initiative of the student are satisfactory on any job, the citizenship grade can be determined by averaging the knowledge and technique grades made on the job by the student. ***The amount and quality of work both as to knowledge and technique attained by the student on a given job are a good indication and a sound basis upon which to judge the four points listed under citizenship.***

For example, if a student earns a mark of C on knowledge and a B on technique, the citizenship mark would average C+. The final average job grade would then be a C+. When grading is done systematically on this basis, and the students know that it is done by a system of averages which works alike for all, there are very little or no complaints relative to grades or marks "earned" on each job.

Determination of Marking Period and Semester Grades

Average job grades are posted from the job-record cards onto each student record card shown in Figure 2. At the end of each marking period grades can be averaged quickly on this student-record card to determine the average marking-period grade as to quality of work. At the end of each marking period it is well to determine a *speed-of-work* grade by taking the least number of jobs completed by the slowest student and adding the highest number completed by the fastest student, and then dividing the total by two to determine the class average. Then, set up a scale above and below the average number — as, for example, say, lowest is 4 and highest is 10 jobs completed, then 10+4=14, 14÷2=7, the average number

STUDENT RECORD CARD
TRADE DRAFTING DEPT.

NAME L. M. Accurate COURSE 10B
ADDRESS 408 S. Michigan Ave. SEMESTER 1
PARENT'S NAME B. Accurate PHONE 2-2426

ATTENDANCE

HRS. / DAYS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	TIME HRS.
M	E																				POSSIBLE 300
T						a									T						
W			a						a												
TH																					
F												a									ACTUAL 285

GRADES

1- MARKING PERIOD

JOB	1	2	3	4	5	6	7	8	9	10	11	12		
MARK	C	B	B	B+	a	a	a	a	a	a	a		QUALITY	a
J													SPEED	a
M													CITIZENSHIP	a
													AV. MARKING-PERIOD GRADE	a

2-MARKING PERIOD

JOB	12	13	14	15	16	17	18	19						
MARK	a	B+	B	a	a	a	a	a					QUALITY	a
J													SPEED	B
M													CITIZENSHIP	B+
													AV. MARKING-PERIOD GRADE	B+

3-MARKING PERIOD

JOB	20	21	22	23	24	25	26	27	28	29	30			
MARK	B	a	a	B+	B+	a	a	a	C	a	a		QUALITY	a
J													SPEED	a
M													CITIZENSHIP	a
													AV. MARKING-PERIOD GRADE	a

4-FINAL EXAMINATION GRADE	B
AV. POINTS 1,2,3,4, TO OBTAIN SEM. GRADE	a

Fig. 2. Student record card

which should be completed. Sample scale:

A = 10 jobs
B = 8 to 9 jobs
C = 6 to 7 jobs
D = 5 to 4 jobs
E = below 4 jobs

An average citizenship grade can be given at the end of each marking period by averaging the citizenship grades made on the job-record cards during the period. This can quickly be determined by having each student bring his job-record cards to the instructor for averaging.

An average of quality, speed, and citizenship grades gives an accurate, systematic evaluation of any student's work for any marking period. In turn, an average of the three marking-period grades plus a final examination grade, if one is given, determines the final semester grade.

Important Features of Grading System

This grading system makes use of a series of consecutive point averages, determined from day to day, from one marking period to the next, and finally the semester grade, all this work of averaging being distributed to such an extent that grades can be determined quickly and easily at the end of each marking period or semester with a minimum amount of work by the instructor.

At the end of any marking period, one class period may be used for averaging of grades. Each student is requested to examine and correct any errors in work completed during the period both as to drawings and notebook material, and to have his job-record cards ready for presentation to the instructor to determine his average period grade when he is called to the desk for that purpose. The instructor then proceeds to call each student to the desk, one at a time, inspecting their work, and systematically averaging the grades to determine the period grade earned by the student.

When the averaging of grades is done in the presence of the individual student and he understands that it is done by a system of averages, the same for all, a feeling of fairness is engendered rather than that of "favoritism," or that it is a matter of the teacher "giving" out grades according to "like or dislike" of the individual student.

This system of grading is convenient, does not need extra time in administration by the teacher, provides an accurate record of each student's work, promotes a sound basis of human relationships between the students and the instructor doing the grading, and encourages students of all types to work so as to earn a higher mark on the point or points in which the system "reveals" that they are weak. In this way, the system results in improved quality and quantity of work and constantly stresses the need and importance of good citizenship.

Conclusions

The writer believes that:

1. The average instructor, by carefully organizing his job-assignment sheets for use with the job-record card, and the student-record card submitted will experience little difficulty in putting this method of grading into operation.

2. As the teacher uses this method of grading, he will develop in efficiency and accuracy to the point where there is a deep satisfaction or feeling that grades for individual students are as nearly right as can be determined by a system of averages; that grading is being done "objectively" rather than "subjectively."

3. This method of grading on a 3-point basis by a system of averages, should be easily adaptable to other shop subjects and possibly a similar 3-point basis of grading can be worked out for academic work or studies. It would appear that all that is necessary to do this is to revise the job-record card for the particular subject to be taught on the basis of job assignments.

Casting in the School Shop—VII

N. A. McMillan
Elmira, New York

For previous lessons in this series, see January and September, 1934, May and October, 1935, and April and September, 1936, issues of this magazine.

There is a large variety of materials used in molding, but the following study will consist only of the materials used in nonferrous casting. Therefore, only green sand, core sand, facings, core bindings, parting, and fire clay will be dealt with.

Green Sand. The three principal divisions in sand molding are green sand, dry sand, and loam work. For our purpose, we will use green sand.

Molding sand is a sand possessing those qualities which enable it to be tempered and formed to definite shapes. It has the requisite chemical composition to enable it to resist fusion from the heat of the molten metal. Molding sand must have sufficient permeability to permit the free escape of gases from the mold while the latter is being filled with metal, without scrabbling or otherwise injuring the surface of the mold. The sand also should be capable of being retempered and used for successive molds without the addition of new sand to provide bond.

Molding sand is found in large deposits in the states of New York, New Jersey, Ohio, Indiana, Illinois, Missouri, and Kentucky. The sand we will use comes from Albany, N. Y., and is called No. 1 Albany Sand. As this is commonly used, it is the most easily obtainable in most places, especially through out the eastern states.

Requirements of Molding Sand. Good molding sand must possess resistance to fusion, permeability, and porosity. An excess of lime — 1 per cent or more — will lower the power of the sand to resist fusion. If present as a silicate, it will combine with the silica and alumina of the sand, under the influence of the heat of the molten metal, and will vitrify and form a scale on the casting. Permeability, or ability to permit the passage through it of gases formed in the mold while filling with metal, is one of the most important qualities of molding sand. There is a difference between permeability and porosity. The porosity of a sand is the ratio of voids or pore spaces to the total volume of the sand, while the permeability depends on the area of the passage ways through the sand formed by these voids. Air fills the pores in the mold, and expands when heated during the pouring of the metal. The sand must have sufficient cohesion or bond to resist the pressure due to this expansion, and it also must have sufficient permeability to permit the escape of the contained air and of the gases generated in pouring. The greater the ease with which the air and gases

escape, the less bond there is in the sand. In green sand, more or less water is contained in the mold which is converted into steam in casting, and this also must escape. If the steam cannot escape easily through the mold or core, blowholes are formed and the casting is injured. A molding sand, therefore, must not only have cohesion between its particles to withstand certain strains, but it must at the same time possess the desired permeability.

The following table illustrates No. 1 Albany Sand and its composition.

Unused No. 1 Albany Sand

Silica (S_1O_2)	80.88
Alumina (Al_2O_3)	14.03
Iron oxide (Fe_2O_3)	1.32
Combined water	2.54
Pore space	43.3
Tensile strength	4.31 lb. per sq. in.

The character of the castings to be made governs the selection of the molding sand that is to be used. Small thin castings for ornamental work, having on their surface a series of lines, depressions, and projections, require a very fine-grained molding sand. A coarse sand, used for castings of this kind, will not only fail to reproduce the design but will leave rough surfaces and imperfect lines. For molding very fine castings in bronze, what is known as French sand is necessary.

Molding sand, after being used a certain length of time, loses its bond or cohesion. Every time a casting is removed from the mold, a certain amount of sand adheres to it and is thereby lost. New sand is added to the sand heap, not only to make up for the loss, but restore the bond to the older sand. New molding sand is of a yellowish or reddish-yellowish appearance, ranging to a deep reddish brown due to the presence of oxide of iron. Molding sand which has been used gradually assumes a black color, due to the presence of sea-coal facing which is burned into the sand.

Preparation of Sand for Molding. After the flasks in which the previous day's castings were made have been shaken out and the castings removed from the sand, the sand is wet down. This can be done with a sprinkling can or a pail of water, swirling the pail around in a circular path and tipping it so that the water will swish over the edge on one side to form a thin sheet which will cover quite an area. This operation is continued until, in the judgment of the molder, the sand is sufficiently damp. If, in molding on the previous day, the sand has shown insufficient strength, new molding sand is at this point added to the heap, it being spread over the entire surface. The sand is then "cut over" with the shovel. As each shovelful of sand is thrown, a twist must be given to the shovel so that the sand is spread as much as possible. Lumps are broken up with the flat or underside of the shovel. Any dry portions, which are encountered in cutting the sand, are moistened, care being taken to avoid making the sand too wet. An excess of moisture in the sand will cause the metal in the mold to bubble or kick, whereas sand that is too dry will crumble when the pattern is drawn. It is difficult, if not impossible, to describe a properly tempered sand, which is determined by the sense of touch of the molder. This can be acquired only by experience.

Foundrymen have many methods of testing the physical quality of molding sands. For instance, a foundryman will take a handful of tempered sand, squeeze it in his hand to form an elongated mass. He then suspends it by one end from between his thumb and forefinger. If it breaks off under its own weight, it is not considered a strong sand. If however, it hangs together, thus indicating strength, there may be an excessive amount of clay present. Therefore, a small portion is wet and rubbed between the thumb and forefinger. The amount of clay is then judged from the stickiness of the sand.

Core Sand. Core sands are clean silica sands, containing little clay or other contaminating materials. The highest grade of core sand is a silica sand from Ottawa, Ill. This sand is 99 per cent pure and quite even in grain size. Lake and beach sands are used to a great extent for core sands. The dune sand around the Great Lakes is the largest source of our core sands at present. These dunes contain clean sand washed by the rains and the lake and piled by the wind. Beach sand is similar to dune sand in that it is clean and of fairly uniform size as to grain. Bank sand usually is not clean, and has a larger variety of grain sizes than dune or beach sand. Parting sand is a fine core sand used for parting molds.

Core Binders. Because of the nature of core sand, and because a core must be baked in an oven, it is necessary to mix a core binder with the sand to hold the sand together. There are four common binders used, namely, water-soluble binders, oil binders, pitch binders, and rosin binders. For our purpose, we will use, an oil binder because it is the most convenient to have on hand.

Oil binders used for cores are similar to the paint oils. There are four common core oils: linseed oil, fish oil, soya-bean oil, and china-wood oil. These oils harden by oxidation. Linseed oil is the best binder and most core oils are specified as having a linseed-oil base. The amount of oil applied when mixing with sand can be determined by experience.

Mold Facings. Facing is the term given to materials applied to or mixed with the sand that comes in contact with the molten metal. The object is to give a smooth surface to the casting. This is accomplished in two ways. The usual method is to apply the facing as a fine powder to the surface of the mold after the pattern is drawn. A thin coating is thus formed which will not melt, thereby preventing the sand that partially melts from sticking to the casting. This facing burns very slowly under the heat of the metal, and forms a thin film of gas between the sand and iron during the cooling process. This prevents the metal from burning into the sand and causes the sand to separate readily from the casting when cold.

Graphite is the best and most easily obtained facing. Graphite is a mineral form of carbon. It is mined from the earth and shipped in lumps which are blacker than coal and are soft and greasy like a lump of clay. The purest graphite comes from the island of Ceylon, India. There are several beds, however, in the coal fields of North America.

Parting Material. Parting sand is too coarse for benchwork in brass and aluminum. There are parting materials on the market that are shaken from cloth sacks on the mold. The most common parting material is composed of tripoli mixed with a very small amount of tallow. Tripoli is a very finely ground aluminum silicate commonly used for polishing glass and metals.

Fire Clay. Fire clay comes from the same source that sand does. It is almost pure oxide of alumina, which is separated from the sand by a complex chemical action of the waters of the streams. It is found in the lowest strata of the deposit beds. It is used to mix with fire sand in the proportion of 1 to 2 as the daubing mixture of cupolas and ladles.

Fire clays are of two kinds: the flint clays and plaster clays. The flint clays are more refractory than the plaster clays. The clays are never pure, and their melting points vary a great deal and often the cause of this difference in melting point cannot be accounted for. The fire clays come mostly from Pennsylvania, Kentucky, Missouri, and Illinois.

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

J. J. Metz, Editor

The Homecrafter vs. The School Shop

A letter recently received from a shop teacher contains the statement: "Homecrafters are ahead of us on manipulations and operations and equipment, and most of them think our school methods and equipment are obsolete."

The ideas and inferences contained in this comment seem somewhat jumbled. Homecrafters, manipulations, operations, equipment, obsolescence — all shot into one sentence are disconcerting to say the least, yet a bit of analyzing may help.

Who are the homecrafters? Some of them are boys still attending school, others are mechanics, business men, men engaged in numerous occupations, men who are unemployed, professional men, and the like. Their educational and practical backgrounds are as varied as their occupations. Some are inventors and engineers with education, practical training, and experience way beyond the ordinary; others have received but an elementary-school training.

The same variation exists in the homecrafter's home-shop equipment. The writer has been told of one wealthy man who has a large basement shop equipped with the finest and most complete assortment of woodworking and metalworking machinery. This man prides himself on its up-to-dateness, and orders every new bit of accessory as it appears on the market. Then, there are homecrafters who have shops where the equipment hardly deserves that name, and yet they, too, produce work; they, too, are homecrafters.

There are individual homecrafters, then, who have every reason to excel in workmanship, in manipulative skill, and even in up-to-dateness of equipment. But no energetic shop teacher need consider himself outranked by the average homecrafter. If the instructor really lacks manual skill, why not join the homecrafters and learn their secrets, if they possess any? Homecrafters are usually a fine lot who are more than willing to tell others how they do things. Assiduous practice, then, would bring the teacher's skill to that of at least the average homecrafter. If the "us" in the statement quoted refers to the student rather than to the instructor, then the statement contains nothing that might be construed as derogatory to the school shop, for in most cases, the average homecrafter may be assumed to have had the industrial-arts work taught in his school system. As homecrafter, then, he starts out on the level of one having finished the shopwork in the schools and ought to be able to proceed from there on. With the additional urge of the interest which activates the homecrafter, it is natural, too, that such a worker ought to be able to attempt projects which are beyond the student who is just acquiring his first knowledge of shopwork.

As to the superiority of the homecrafters' equipment, that depends upon conditions. The average homecrafter's equipment is rather a heterogeneous collection of odds and ends — some of it good, some exceedingly poor. If, in individual cases, it "is ahead" of the school's equipment, that too, may be proper, because the aims of a given homecrafter's shop may require equipment which would be beyond the scope of the objectives set up for a given school shop.

Probably a perusal of the article "Home Workshop Organization," by Ross C. Cramlet and William L. Hunter, page 259, September, 1936, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION may help this instructor get the right slant on the homecrafter, the homecrafter's shop, and the opportunities which exist for extremely helpful contacts between the school shop and the home shop, and between the school-shop teacher and the homecrafter.

Johann Gutenberg, Inventor and Printer

The student of printing is naturally interested in the historical development of his craft. Probably nothing has had such a profound influence on the advance made by man in the last several hundred years as the evolution of the graphic arts, and nothing has promoted the growth and rapid advancement of printing as the epoch-making invention of movable type. It is quite proper then, that each student of printing should have at least a slight acquaintance with the biography of the inventor of movable type, Johann Gutenberg.

As happens so frequently with men who have become famous, little is known of his youth. He was born between the years 1394 and 1399 at Mainz, Germany. His real name is Johann Gänsfleisch. But, as was common in those days, the name of the house in which his father and his ancestors had lived, "zur Laden, zu Gutenberg," was commonly used as his name; hence he is known to us as Johann Gutenberg. His family belonged to the patrician class in Mainz. Nothing is known about his youth. He is definitely known to have lived at Strassburg in 1434 where, in spite of the fact that he was a descendant of patricians, he joined the goldsmiths' guild, and formed a partnership with Andrew Dritzehn, and Andrew and Anton Heilman. In this undertaking, a number of activities seem to have been followed, Gutenberg officiating as the manager of the business. Evidently during this period, he was making experiments in perfecting the art of printing. In 1448, he was again at Mainz. The work on his invention had cost him a great deal of money, but it was finally ready to be tested. Its first use seems to have been made in the printing of the "Weltgerichtsgedicht" (poem on the Last Judgment) and the "Calendar for 1448." In 1450, Gutenberg formed a partnership with Johann Fust, or Faust, a money lender of Mainz, in order to perfect his invention, and to print the "42-line Bible," so called because there were to be 42 lines in each of the two columns on each page. This piece of work was finished some time between 1453 and 1455. The partnership did not, however, work out to Gutenberg's advantage, as Fust brought suit against him in 1455 to recover the money which he had advanced. Gutenberg, of course, could not repay the 2000 Gulden that were involved, and Fust took most of the type and the machinery that had been made up to that time.

Not daunted by his misfortune, however, Gutenberg proceeded to build a new printer's outfit with money advanced to him by a wealthy lawyer named Conrad Humery. The type that he made at this time was quite small and imitated the round, cursive handwriting that had been used up to that time by the monks in making their copies of the Bible and other books. This type was used in a grammar and lexicon which appeared in 1460, and in several other books that were published as late as 1472 in a printshop conducted by some of Gutenberg's relatives.

There is little more known about this great inventor. Fortunately for him, he received an appointment to the court of the Archbishop of Nassau in 1465. This gave him at least some income for his declining years. He died in 1467 or 68 at Mainz, and was buried in the Franciscan Church of the city.

Because of Gutenberg's contribution, the development of European and world culture undeniably was greatly hastened. His invention spread rapidly and paved the way for the remarkable progress which marks our present age.

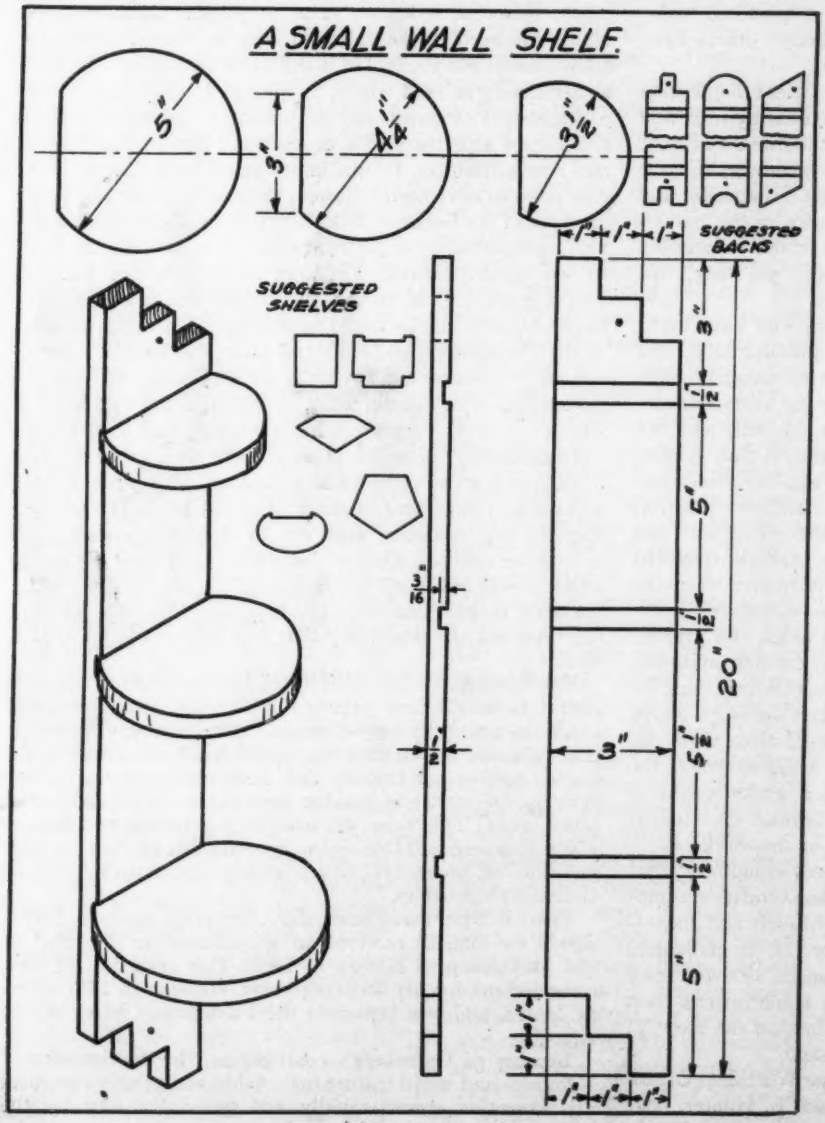
Problems and Projects

A SMALL MODERN WALL SHELF

Glenn H. Osborne, High School, Ottumwa, Iowa

This drawing of a small modern wall shelf represents an excellent problem for the upper grades, as many tool operations are involved. In addition, most of the wood may be obtained from the scrap pile, or packing-box wood may be used. The shape of the top and bottom of the back and the shelves may be changed to suit the ideas of the worker; designs also may be placed on the back between the shelves. A number of alternative designs for shaping the shelves and back are shown in the illustration. The shelves should be fastened to the back with screws, and the shelf itself fastened to the wall by means of escutcheon pins or screws.

If hardwood is used, the finish can be applied in the usual manner, but if softwood is used, it is well to apply paint or quick-drying enamel, with the edges of the shelf painted a contrasting color.



AN A.C.-D.C. RADIO RECEIVER

Gilbert Oberweiser, Milwaukee, Wisconsin

Part I — The Power Supply

During the past decade, the field of radio has so expanded that now vacuum-tube circuits are even being considered in the light of their industrial application. Considering this, familiarizing students of the electrical departments with the use of radio equipment will be keeping them abreast with the trends. Also, wiring such a receiver as this from the schematic diagrams will acquaint them with many of the very common electrical symbols.

Aside from its value as a project, the purpose of this article is to make possible the construction of a radio receiver simple enough to be built by those who have not had much experience in this field, yet efficient enough so that its construction will be worth while.

Since attempting to explain the function of this receiver from its integral form might result in confusion, the discussion concerning it has been divided into three parts: the power supply, the detector, and the amplifier. Moreover, each of these divisions is a fair representation of an electrical principle of rectification; the detector can be made to explain signal detection; and the principle involved in the amplifier is the same as that involved in amplifier telephone and radio-frequency circuits.

It might be said here that students not very familiar with this field will find it profitable to wire this receiver one unit at a time, testing each unit before wiring the complete receiver. In this way, it will be easier to locate mistakes, if there happen to be any.

Function of the Power Supply

The modern power supply takes the place of the A and B batteries that were used in the old type of radio receiver. Its purpose is that of supplying proper plate voltages and heater currents to the tubes. In other words, it is that part of the receiver which supplies the energy necessary to make the receiver operate.

In the power supply under discussion, the heater current for the tubes is taken directly from the line. The 200-ohm resistor in series with the heaters (see diagram Fig. 5) acts to cut the current supply of the heaters to its proper value (0.3 amp.). It will be noticed that the heaters of the three tubes that will be used in the receiver are included in this diagram. This is because they are connected in series with the heater of the rectifier, and cannot economically be separated.

The more important function of this power supply, though, is that of supplying the receiver with a smooth d.c. plate voltage. This means that it must convert the a.c. input voltage to a nonrippling d.c.-output voltage with as little loss as is feasible.

Theory of Operation

For explanatory purposes, the part of this power supply that is to furnish the plate voltages can be divided into two

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INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

LUMBER

COST of LUMBER 7 INCHES WIDE

Length		Bd.Ft.	Cost per Foot													
Ft.-In.	In.		½¢	4¢	5¢	6¢	7¢	8¢	9¢	10¢	11¢	12¢	13¢	14¢	15¢	16¢	17¢
0-6	6	.29	.00	.01	.01	.02	.02	.02	.03	.03	.03	.04	.04	.04	.04	.05	.05
1-0	12	.58	.00	.02	.03	.04	.04	.05	.05	.06	.06	.07	.08	.08	.09	.09	.10
1-6	18	.86	.00	.04	.04	.05	.06	.07	.08	.09	.10	.11	.11	.12	.13	.14	.15
2-0	24	1.17	.01	.05	.06	.07	.08	.09	.11	.12	.13	.14	.15	.16	.18	.19	.20
2-6	30	1.46	.01	.08	.07	.09	.10	.12	.13	.15	.16	.18	.19	.20	.22	.23	.25
3-0	36	1.75	.01	.07	.08	.11	.12	.14	.16	.18	.19	.21	.23	.25	.26	.28	.30
3-6	42	2.04	.01	.08	.10	.12	.14	.16	.18	.20	.22	.25	.27	.29	.31	.33	.35
4-0	48	2.33	.01	.09	.12	.14	.16	.19	.21	.23	.26	.28	.30	.33	.35	.37	.40
4-6	54	2.63	.01	.11	.13	.16	.18	.21	.24	.26	.29	.32	.34	.37	.39	.42	.45
5-0	60	2.92	.01	.12	.15	.18	.20	.23	.26	.29	.32	.35	.38	.41	.44	.47	.50
5-6	66	3.21	.02	.13	.16	.19	.22	.26	.29	.32	.35	.39	.42	.45	.48	.51	.55
6-0	72	3.50	.02	.14	.18	.21	.25	.28	.32	.35	.39	.42	.46	.49	.53	.56	.60
6-6	78	3.79	.02	.15	.19	.23	.27	.30	.34	.38	.42	.46	.49	.53	.57	.61	.64
7-0	84	4.08	.02	.16	.20	.25	.29	.33	.37	.41	.45	.49	.53	.57	.61	.65	.69
7-6	90	4.38	.02	.18	.22	.26	.31	.35	.39	.44	.48	.53	.57	.61	.66	.70	.74
8-0	96	4.67	.02	.19	.23	.28	.33	.37	.42	.47	.51	.56	.61	.65	.70	.75	.79
8-6	102	4.96	.02	.20	.25	.30	.35	.40	.45	.50	.55	.60	.64	.69	.74	.79	.84
9-0	108	5.25	.03	.21	.26	.32	.37	.42	.47	.53	.58	.63	.68	.74	.79	.84	.89
9-6	114	5.54	.03	.22	.28	.33	.39	.44	.50	.55	.61	.67	.72	.78	.83	.89	.94
10-0	120	5.83	.03	.23	.29	.35	.41	.47	.53	.58	.64	.70	.76	.82	.88	.93	.99
10-6	126	6.13	.03	.25	.31	.37	.43	.49	.55	.61	.67	.74	.80	.86	.92	.98	1.04
11-0	132	6.42	.03	.26	.32	.39	.45	.51	.58	.64	.71	.77	.83	.90	.96	1.03	1.09
11-6	138	6.71	.03	.27	.34	.40	.47	.54	.60	.67	.74	.81	.87	.94	1.01	1.07	1.14
12-0	144	7.00	.04	.28	.35	.42	.49	.56	.63	.70	.77	.84	.91	.98	1.05	1.12	1.19
12-6	150	7.29	.04	.29	.36	.44	.51	.58	.66	.73	.80	.88	.95	1.02	1.09	1.17	1.24
13-0	156	7.58	.04	.30	.38	.46	.53	.61	.68	.76	.83	.91	.99	1.06	1.14	1.21	1.29
13-6	162	7.88	.04	.32	.39	.47	.55	.63	.71	.79	.87	.95	1.02	1.10	1.18	1.26	1.34
14-0	168	8.17	.04	.33	.41	.49	.57	.65	.74	.82	.90	.98	1.06	1.14	1.23	1.31	1.39
14-6	174	8.46	.04	.34	.42	.51	.59	.68	.76	.85	.93	1.02	1.10	1.18	1.27	1.35	1.44
15-0	180	8.75	.04	.35	.44	.53	.61	.70	.79	.88	.96	1.05	1.14	1.23	1.31	1.40	1.49
15-6	186	9.04	.05	.36	.45	.54	.63	.72	.81	.90	.99	1.09	1.18	1.27	1.36	1.45	1.54
16-0	192	9.33	.05	.37	.47	.56	.65	.75	.84	.93	1.03	1.12	1.21	1.31	1.40	1.49	1.59

COST of LUMBER 9 INCHES WIDE

Length		Bd.Ft.	Cost per Foot													
Ft.-In.	In.		½¢	4¢	5¢	6¢	7¢	8¢	9¢	10¢	11¢	12¢	13¢	14¢	15¢	16¢	17¢
0-6	6	.38	.00	.02	.02	.02	.03	.03	.03	.04	.04	.05	.05	.05	.06	.06	.06
1-0	12	.75	.00	.03	.04	.05	.05	.06	.07	.08	.08	.09	.10	.11	.11	.12	.13
1-6	18	1.13	.01	.05	.06	.07	.08	.09	.10	.11	.12	.14	.15	.16	.17	.18	.19
2-0	24	1.50	.01	.06	.08	.09	.11	.12	.14	.15	.17	.18	.20	.21	.23	.24	.26
2-6	30	1.88	.01	.08	.09	.11	.13	.15	.17	.19	.21	.23	.24	.26	.28	.30	.32
3-0	36	2.25	.01	.09	.11	.14	.16	.18	.20	.23	.25	.27	.29	.32	.34	.36	.38
3-6	42	2.63	.01	.11	.13	.16	.18	.21	.24	.26	.29	.32	.34	.37	.39	.42	.45
4-0	48	3.00	.02	.12	.15	.18	.21	.24	.27	.30	.33	.36	.39	.42	.45	.48	.51
4-6	54	3.38	.02	.14	.17	.20	.24	.27	.30	.34	.37	.41	.44	.47	.51	.54	.57
5-0	60	3.75	.02	.15	.19	.23	.26	.30	.34	.38	.41	.45	.49	.53	.56	.60	.64
5-6	66	4.13	.02	.17	.21	.25	.29	.33	.37	.41	.45	.50	.54	.58	.62	.66	.70
6-0	72	4.50	.02	.18	.23	.27	.32	.36	.41	.45	.50	.54	.59	.63	.68	.72	.77
6-6	78	4.88	.02	.20	.24	.29	.34	.39	.44	.49	.54	.59	.63	.68	.73	.78	.83
7-0	84	5.25	.03	.21	.26	.32	.37	.42	.47	.53	.58	.63	.68	.74	.79	.84	.89

R CHART

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COST of LUMBER 8 INCHES WIDE

Length		Bd.Ft.	Cost per Foot													
Ft.-In.	In.		½¢	4¢	5¢	6¢	7¢	8¢	9¢	10¢	11¢	12¢	13¢	14¢	15¢	16¢	17¢
0-6	6	.33	.00	.01	.02	.02	.02	.03	.03	.03	.04	.04	.04	.05	.05	.05	.06
1-0	12	.67	.00	.03	.03	.04	.05	.05	.06	.07	.07	.08	.09	.09	.10	.11	.11
1-6	18	1.00	.01	.04	.05	.06	.07	.08	.09	.10	.11	.12	.13	.14	.15	.16	.17
2-0	24	1.33	.01	.05	.07	.08	.09	.11	.12	.13	.15	.16	.17	.19	.20	.21	.23
2-6	30	1.67	.01	.07	.08	.10	.12	.13	.15	.17	.18	.20	.22	.23	.25	.27	.28
3-0	36	2.00	.01	.08	.10	.12	.14	.16	.18	.20	.22	.24	.26	.28	.30	.32	.34
3-6	42	2.33	.01	.09	.12	.14	.16	.19	.21	.23	.26	.28	.30	.33	.35	.37	.40
4-0	48	2.67	.01	.11	.13	.16	.19	.21	.24	.27	.29	.32	.35	.37	.40	.43	.45
4-6	54	3.00	.02	.12	.15	.18	.21	.24	.27	.30	.33	.36	.39	.42	.45	.48	.51
5-0	60	3.33	.02	.13	.17	.20	.23	.27	.30	.33	.37	.40	.43	.47	.50	.53	.57
5-6	66	3.67	.02	.15	.18	.22	.26	.29	.33	.37	.40	.44	.48	.51	.55	.59	.62
6-0	72	4.00	.02	.16	.20	.24	.28	.32	.36	.40	.44	.48	.52	.56	.60	.64	.68
6-6	78	4.33	.02	.17	.22	.26	.30	.35	.39	.43	.48	.52	.56	.61	.65	.69	.74
7-0	84	4.67	.02	.19	.23	.28	.33	.37	.42	.47	.51	.56	.61	.65	.70	.75	.79
7-6	90	5.00	.03	.20	.25	.30	.35	.40	.45	.50	.55	.60	.65	.70	.75	.80	.85
8-0	96	5.33	.03	.21	.27	.32	.37	.43	.48	.53	.59	.64	.69	.75	.80	.85	.91
8-6	102	5.67	.03	.23	.28	.34	.40	.45	.51	.57	.62	.68	.74	.79	.85	.91	.96
9-0	108	6.00	.03	.24	.30	.36	.42	.48	.54	.60	.66	.72	.78	.84	.90	.96	1.02
9-6	114	6.33	.03	.25	.32	.38	.44	.51	.57	.63	.70	.76	.82	.89	.95	1.01	1.08
10-0	120	6.67	.03	.27	.33	.40	.47	.53	.60	.67	.73	.80	.87	.93	1.00	1.07	1.13
10-6	126	7.00	.04	.28	.35	.42	.49	.56	.63	.70	.77	.84	.91	.98	1.05	1.12	1.19
11-0	132	7.33	.04	.29	.37	.44	.51	.59	.66	.73	.81	.88	.95	1.03	1.10	1.17	1.25
11-6	138	7.67	.04	.31	.38	.46	.54	.61	.69	.77	.84	.92	1.00	1.07	1.15	1.23	1.30
12-0	144	8.00	.04	.32	.40	.48	.56	.64	.72	.80	.88	.96	1.04	1.12	1.20	1.28	1.36
12-6	150	8.33	.04	.33	.42	.50	.58	.67	.75	.83	.92	1.00	1.08	1.17	1.25	1.33	1.42
13-0	156	8.67	.04	.35	.43	.52	.61	.69	.78	.87	.95	1.04	1.13	1.21	1.30	1.39	1.47
13-6	162	9.00	.05	.36	.45	.54	.63	.72	.81	.90	.99	1.08	1.17	1.26	1.35	1.44	1.53
14-0	168	9.33	.05	.37	.47	.56	.65	.75	.84	.93	1.03	1.12	1.21	1.31	1.40	1.49	1.59
14-6	174	9.67	.05	.39	.48	.58	.68	.77	.87	.97	1.06	1.16	1.26	1.35	1.45	1.55	1.64
15-0	180	10.00	.05	.40	.50	.60	.70	.80	.90	1.00	1.10	1.20	1.30	1.40	1.50	1.60	1.70
15-6	186	10.33	.05	.41	.52	.62	.72	.83	.93	1.03	1.14	1.24	1.34	1.45	1.55	1.65	1.76
16-0	192	10.67	.05	.43	.53	.64	.75	.85	.96	1.07	1.17	1.28	1.39	1.49	1.60	1.71	1.81

COST of LUMBER 10 INCHES WIDE

Length		Bd.Ft.	Cost per Foot													
Ft.-In.	In.		½¢	4¢	5¢	6¢	7¢	8¢	9¢	10¢	11¢	12¢	13¢	14¢	15¢	16¢	17¢
0-6	6	.42	.00	.02	.02	.03	.03	.03	.04	.04	.05	.05	.05	.06	.06	.07	.07
1-0	12	.83	.00	.03	.04	.05	.06	.07	.08	.08	.09	.10	.11	.12	.13	.13	.14
1-6	18	1.25	.01	.05	.06	.08	.09	.10	.11	.13	.14	.15	.16	.18	.19	.20	.21
2-0	24	1.67	.01	.07	.08	.10	.12	.13	.15	.17	.18	.20	.22	.23	.25	.27	.28
2-6	30	2.08	.01	.08	.10	.13	.15	.17	.19	.21	.23	.25	.27	.29	.31	.33	.35
3-0	36	2.50	.01	.10	.13	.15	.18	.20	.23	.25	.28	.30	.33	.35	.38	.40	.43
3-6	42	2.92	.01	.12	.15	.18	.20	.23	.26	.29	.32	.35	.38	.41	.44	.47	.50
4-0	48	3.33	.02	.13	.17	.20	.23	.27	.30	.33	.37	.40	.43	.47	.50	.53	.57
4-6	54	3.75	.02	.15	.19	.23	.26	.30	.34	.38	.41	.45	.49	.53	.56	.60	.64
5-0	60	4.17	.02	.17	.21	.25	.29	.33	.38	.42	.46	.50	.54	.58	.63	.67	.71
5-6	66	4.58	.02	.18	.23	.28	.32	.37	.41	.46	.50	.55	.60	.64	.69	.73	.78
6-0	72	5.00	.03	.20	.25	.30	.35	.40	.45	.50	.55	.60	.65	.70	.75	.80	.85
6-6	78	5.42	.03	.22	.27	.33	.38	.43	.49	.54	.60	.65	.70	.76	.81	.87	.92
7-0	84	5.83	.03	.23	.29	.35	.41	.47	.53	.58	.64	.70	.76	.82	.88	.93	.99

5-0	72	4.50	.02	.18	.23	.27	.32	.38	.41	.45	.50	.54	.59	.63	.68	.72	.77
6-6	78	4.88	.02	.20	.24	.29	.34	.39	.44	.49	.54	.59	.63	.68	.73	.78	.83
7-0	84	5.25	.03	.21	.26	.32	.37	.42	.47	.53	.58	.63	.68	.74	.79	.84	.89
7-6	90	5.63	.03	.23	.28	.34	.39	.45	.51	.56	.62	.68	.73	.79	.84	.90	.96
8-0	96	6.00	.03	.24	.30	.36	.42	.48	.54	.60	.66	.72	.78	.84	.90	.96	1.02
8-6	102	6.38	.03	.26	.32	.38	.45	.51	.57	.64	.70	.77	.83	.89	.96	1.02	1.08
9-0	108	6.75	.03	.27	.34	.41	.47	.54	.61	.68	.74	.81	.88	.95	1.01	1.08	1.15
9-6	114	7.13	.04	.29	.36	.43	.50	.57	.64	.71	.78	.86	.93	1.00	1.07	1.14	1.21
10-0	120	7.50	.04	.30	.38	.45	.53	.60	.68	.75	.83	.90	.98	1.05	1.13	1.20	1.28
10-6	126	7.88	.04	.32	.39	.47	.55	.63	.71	.79	.87	.95	1.02	1.10	1.18	1.26	1.34
11-0	132	8.25	.04	.33	.41	.50	.58	.66	.74	.83	.91	.99	1.07	1.16	1.24	1.32	1.40
11-6	138	8.63	.04	.35	.43	.52	.60	.69	.78	.86	.95	1.04	1.12	1.21	1.29	1.38	1.47
12-0	144	9.00	.05	.36	.45	.54	.63	.72	.81	.90	.99	1.08	1.17	1.26	1.35	1.44	1.53
12-6	150	9.38	.05	.38	.47	.56	.66	.75	.84	.94	1.03	1.13	1.22	1.31	1.41	1.50	1.59
13-0	156	9.75	.05	.39	.49	.59	.68	.78	.88	.98	1.07	1.17	1.27	1.37	1.46	1.56	1.66
13-6	162	10.13	.05	.41	.51	.61	.71	.81	.91	1.01	1.11	1.22	1.32	1.42	1.52	1.62	1.72
14-0	168	10.50	.05	.42	.53	.63	.74	.84	.95	1.05	1.16	1.26	1.37	1.47	1.58	1.68	1.79
14-6	174	10.88	.05	.44	.54	.65	.76	.87	.98	1.09	1.20	1.31	1.41	1.52	1.63	1.74	1.85
15-0	180	11.25	.06	.45	.56	.68	.79	.90	1.01	1.13	1.24	1.35	1.46	1.58	1.69	1.80	1.91
15-6	186	11.63	.06	.47	.58	.70	.81	.93	1.05	1.16	1.28	1.40	1.51	1.63	1.74	1.86	1.98
16-0	192	12.00	.06	.48	.60	.72	.84	.96	1.08	1.20	1.32	1.44	1.56	1.68	1.80	1.92	2.04

COST of LUMBER 11 INCHES WIDE

Length		Bd.Ft.	Cost per Foot														
Ft.-In.	In.		½¢	4¢	5¢	6¢	7¢	8¢	9¢	10¢	11¢	12¢	13¢	14¢	15¢	16¢	17¢
0-6	6	.46	.00	.02	.02	.03	.03	.04	.04	.05	.05	.06	.06	.06	.07	.07	.08
1-0	12	.92	.00	.04	.05	.06	.06	.07	.08	.09	.10	.11	.12	.13	.14	.15	.16
1-6	18	1.38	.01	.06	.07	.08	.10	.11	.12	.14	.15	.17	.18	.19	.21	.22	.23
2-0	24	1.83	.01	.07	.09	.11	.13	.15	.17	.18	.20	.22	.24	.26	.28	.29	.31
2-6	30	2.29	.01	.09	.11	.14	.16	.18	.21	.23	.25	.28	.30	.32	.34	.37	.39
3-0	36	2.75	.01	.11	.14	.17	.19	.22	.25	.28	.30	.33	.36	.39	.41	.44	.47
3-6	42	3.21	.02	.13	.16	.19	.22	.26	.29	.32	.35	.39	.42	.45	.48	.51	.55
4-0	48	3.67	.02	.15	.18	.22	.26	.29	.33	.37	.40	.44	.48	.51	.55	.59	.62
4-6	54	4.13	.02	.17	.21	.25	.29	.33	.37	.41	.45	.50	.54	.58	.62	.66	.70
5-0	60	4.58	.02	.18	.23	.28	.32	.37	.41	.46	.50	.55	.60	.64	.69	.73	.78
5-6	66	5.04	.03	.20	.25	.30	.35	.40	.45	.50	.55	.61	.66	.71	.76	.81	.86
6-0	72	5.50	.03	.22	.28	.33	.39	.44	.50	.55	.60	.66	.72	.77	.83	.88	.94
6-6	78	5.96	.03	.24	.30	.36	.42	.48	.54	.60	.66	.72	.77	.83	.89	.95	1.01
7-0	84	6.42	.03	.26	.32	.39	.45	.51	.58	.64	.71	.77	.83	.90	.96	1.03	1.09
7-6	90	6.88	.03	.28	.34	.41	.48	.55	.62	.69	.76	.83	.89	.96	1.03	1.10	1.17
8-0	96	7.33	.04	.29	.37	.44	.51	.59	.66	.73	.81	.88	.95	1.03	1.10	1.17	1.25
8-6	102	7.79	.04	.31	.39	.47	.55	.62	.70	.78	.86	.94	1.01	1.09	1.17	1.25	1.32
9-0	108	8.25	.04	.33	.41	.50	.58	.66	.74	.83	.91	.99	1.07	1.16	1.24	1.32	1.40
9-6	114	8.71	.04	.35	.44	.52	.61	.70	.78	.87	.96	1.05	1.13	1.22	1.31	1.39	1.48
10-0	120	9.17	.05	.37	.46	.55	.64	.73	.83	.92	1.01	1.10	1.19	1.28	1.38	1.47	1.56
10-6	126	9.63	.05	.39	.48	.58	.67	.77	.87	.96	1.06	1.16	1.25	1.35	1.44	1.54	1.64
11-0	132	10.08	.05	.40	.50	.61	.71	.81	.91	1.01	1.11	1.21	1.31	1.41	1.51	1.61	1.71
11-6	138	10.54	.05	.42	.53	.63	.74	.84	.95	1.05	1.16	1.27	1.37	1.48	1.58	1.69	1.79
12-0	144	11.00	.06	.44	.55	.66	.77	.88	.99	1.10	1.21	1.32	1.43	1.54	1.65	1.76	1.87
12-6	150	11.46	.06	.46	.57	.69	.80	.92	1.03	1.15	1.26	1.38	1.49	1.60	1.72	1.83	1.95
13-0	156	11.92	.06	.48	.60	.71	.83	.95	1.07	1.19	1.31	1.43	1.55	1.67	1.79	1.91	2.03
13-6	162	12.38	.06	.50	.62	.74	.87	.99	1.11	1.24	1.36	1.49	1.61	1.73	1.86	1.98	2.10
14-0	168	12.83	.06	.51	.64	.77	.90	1.03	1.15	1.28	1.41	1.54	1.67	1.80	1.93	2.05	2.18
14-6	174	13.29	.07	.53	.66	.80	.93	1.06	1.20	1.33	1.46	1.60	1.73	1.86	1.99	2.13	2.26
15-0	180	13.75	.07	.55	.69	.82	.96	1.10	1.24	1.38	1.51	1.65	1.79	1.93	2.06	2.20	2.34
15-6	186	14.21	.07	.57	.71	.85	.99	1.14	1.28	1.43	1.56	1.71	1.85	1.99	2.13	2.27	2.42
16-0	192	14.67	.07	.59	.73	.88	1.03	1.17	1.32	1.48	1.61	1.76	1.91	2.05	2.20	2.35	2.49

These lumber tables have been calculated for lumber 1 in. thick. Another group of six appeared last month. The tables have been carefully calculated and checked, and it is hoped that they will take the drudgery out of lumber-cost calculations.

To find the cost of lumber thi the quantities taken from the table Thus, for lumber 3 in. thick, multi table by 3; for 4-in. lumber, by 4,

For prices per foot not on the

6-0	72	6.00	.03	.20	.25	.30	.35	.40	.45	.50	.55	.60	.65	.70	.75	.80	.85
6-6	78	6.42	.03	.22	.27	.33	.38	.43	.49	.54	.60	.65	.70	.76	.81	.87	.92
7-0	84	6.83	.03	.23	.29	.35	.41	.47	.53	.58	.64	.70	.76	.82	.88	.93	.99
7-6	90	6.25	.03	.25	.31	.38	.44	.50	.56	.62	.69	.75	.81	.88	.94	1.00	1.06
8-0	96	6.67	.03	.27	.33	.40	.47	.53	.60	.67	.73	.80	.87	.93	1.00	1.07	1.13
8-6	102	7.08	.04	.28	.35	.43	.50	.57	.64	.71	.78	.85	.92	.99	1.06	1.13	1.20
9-0	108	7.50	.04	.30	.38	.45	.53	.60	.68	.75	.83	.90	.98	1.05	1.13	1.20	1.28
9-6	114	7.92	.04	.32	.40	.48	.55	.63	.71	.79	.87	.95	1.03	1.11	1.19	1.27	1.35
10-0	120	8.33	.04	.33	.42	.50	.58	.67	.75	.83	.92	1.00	1.08	1.17	1.25	1.33	1.42
10-6	126	8.75	.04	.35	.44	.53	.61	.70	.79	.88	.96	1.05	1.14	1.23	1.31	1.40	1.49
11-0	132	9.17	.05	.37	.46	.55	.64	.73	.83	.92	1.01	1.10	1.19	1.28	1.38	1.47	1.56
11-6	138	9.58	.05	.38	.48	.58	.67	.77	.86	.96	1.05	1.15	1.25	1.34	1.44	1.53	1.63
12-0	144	10.00	.05	.40	.50	.60	.70	.80	.90	1.00	1.10	1.20	1.30	1.40	1.50	1.60	1.70
12-6	150	10.42	.05	.42	.52	.63	.73	.83	.94	1.04	1.15	1.25	1.35	1.46	1.56	1.67	1.77
13-0	156	10.83	.05	.43	.54	.65	.76	.87	.98	1.08	1.19	1.30	1.41	1.52	1.63	1.73	1.84
13-6	162	11.25	.06	.45	.56	.68	.79	.90	1.01	1.13	1.24	1.35	1.46	1.58	1.69	1.80	1.91
14-0	168	11.67	.06	.47	.58	.70	.82	.93	1.05	1.17	1.28	1.40	1.52	1.63	1.75	1.87	1.98
14-6	174	12.08	.06	.48	.60	.73	.85	.97	1.09	1.21	1.33	1.45	1.57	1.69	1.81	1.93	2.05
15-0	180	12.50	.06	.50	.63	.75	.88	1.00	1.13	1.25	1.38	1.50	1.63	1.75	1.88	2.00	2.13
15-6	186	12.92	.06	.52	.65	.78	.90	1.03	1.16	1.29	1.42	1.55	1.68	1.81	1.94	2.07	2.20
16-0	192	13.33	.07	.53	.67	.80	.93	1.07	1.20	1.33	1.47	1.60	1.73	1.87	2.00	2.13	2.27

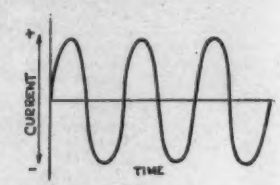
COST of LUMBER 12 INCHES WIDE

Length		Bd.Ft.	Cost per Foot														
Ft.-In.	In.		½¢	4¢	5¢	6¢	7¢	8¢	9¢	10¢	11¢	12¢	13¢	14¢	15¢	16¢	17¢
0-6	6	.5	.00	.02	.03	.03	.04	.04	.05	.05	.06	.06	.07	.07	.08	.08	.09
1-0	12	1.0	.01	.04	.05	.06	.07	.08	.09	.10	.11	.12	.13	.14	.15	.16	.17
1-6	18	1.5	.01	.06	.08	.09	.11	.12	.14	.15	.17	.18	.20	.21	.23	.24	.26
2-0	24	2.0	.01	.08	.10	.12	.14	.16	.18	.20	.22	.24	.26	.28	.30	.32	.34
2-6	30	2.5	.01	.10	.13	.15	.18	.20	.23	.25	.28	.30	.33	.35	.38	.40	.43
3-0	36	3.0	.02	.12	.15	.18	.21	.24	.27	.30	.33	.36	.39	.42	.45	.48	.51
3-6	42	3.5	.02	.14	.18	.21	.25	.28	.32	.35	.39	.42	.46	.49	.53	.56	.60
4-0	48	4.0	.02	.16	.20	.24	.28	.32	.36	.40	.44	.48	.52	.56	.60	.64	.68
4-6	54	4.5	.02	.18	.23	.27	.32	.36	.41	.45	.50	.54	.59	.63	.68	.72	.77
5-0	60	5.0	.03	.20	.25	.30	.35	.40	.45	.50	.55	.60	.65	.70	.75	.80	.85
5-6	66	5.5	.03	.22	.28	.33	.39	.44	.50	.55	.61	.66	.72	.77	.83	.88	.94
6-0	72	6.0	.03	.24	.30	.36	.42	.48	.54	.60	.66	.72	.78	.84	.90	.96	1.02
6-6	78	6.5	.03	.26	.33	.39	.46	.52	.59	.65	.72	.78	.85	.91	.98	1.04	1.11
7-0	84	7.0	.04	.28	.35	.42	.49	.56	.63	.70	.77	.84	.91	.98	1.05	1.12	1.19
7-6	90	7.5	.04	.30	.38	.45	.53	.60	.68	.75	.83	.90	.98	1.05	1.13	1.20	1.28
8-0	96	8.0	.04	.32	.40	.48	.56	.64	.72	.80	.88	.96	1.04	1.12	1.20	1.28	1.36
8-6	102	8.5	.04	.34	.43	.51	.60	.68	.77	.85	.94	1.02	1.11	1.19	1.28	1.36	1.45
9-0	108	9.0	.05	.36	.45	.54	.63	.72	.81	.90	.99	1.08	1.17	1.26	1.35	1.44	1.53
9-6	114	9.5	.05	.38	.48	.57	.67	.76	.86	.95	1.05	1.14	1.24	1.33	1.43	1.52	1.62
10-0	120	10.0	.05	.40	.50	.60	.70	.80	.90	1.00	1.10	1.20	1.30	1.40	1.50	1.60	1.70
10-6	126	10.5	.05	.42	.53	.63	.74	.84	.95	1.05	1.16	1.26	1.37	1.47	1.58	1.68	1.79
11-0	132	11.0	.06	.44	.55	.66	.77	.88	.99	1.10	1.21	1.32	1.43	1.54	1.65	1.76	1.87
11-6	138	11.5	.06	.46	.58	.69	.81	.92	1.04	1.15	1.27	1.38	1.50	1.61	1.73	1.84	1.96
12-0	144	12.0	.06	.48	.60	.72	.84	.96	1.08	1.20	1.32	1.44	1.56	1.68	1.80	1.92	2.04
12-6	150	12.5	.06	.50	.63	.75	.88	1.00	1.13	1.25	1.38	1.50	1.63	1.75	1.88	2.00	2.13
13-0	156	13.0	.07	.52	.65	.78	.91	1.04	1.17	1.30	1.43	1.56	1.69	1.82	1.95	2.08	2.21
13-6	162	13.5	.07	.54	.68	.81	.95	1.08	1.22	1.35	1.49	1.62	1.76	1.89	2.03	2.16	2.30
14-0	168	14.0	.07	.56	.70	.84	.98	1.12	1.26	1.40	1.54	1.68	1.82	1.96	2.10	2.24	2.38
14-6	174	14.5	.07	.58	.73	.87	1.02	1.16	1.31	1.45	1.60	1.74	1.89	2.03	2.18	2.32	2.47
15-0	180	15.0	.08	.60	.75	.90	1.05	1.20	1.35	1.50	1.65	1.80	1.95	2.10	2.25	2.40	2.55
15-6	186	15.5	.08	.62	.78	.93	1.09	1.24	1.40	1.55	1.71	1.86	2.02	2.17	2.33	2.48	2.64
16-0	192	16.0	.08	.64	.80	.96	1.12	1.28	1.44	1.60	1.76	1.92	2.08	2.24	2.40	2.56	2.72

lumber thicker than 1 in., multiply
n the table by the given thickness.
hick, multiply the price from the
mber, by 4, etc.
not on the table, add together the quantities obtained from two or more columns found in this table. Thus, for lumber at 23 cents per foot, add the amounts taken from the 11 and 12-cent columns; for 35-cent lumber, add the quantities taken from the 17 and the ½-cent columns, and multiply the result by 2.

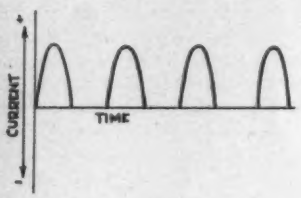
major parts: the rectifying unit and the filtering apparatus.

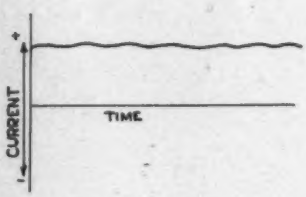
The rectifier is the tube (type 25Z5) which contains two plates, two cathode elements and a heater element which heats the cathodes. The operation of this tube is based upon the principle of thermonic emission; that is, the cathode of the tube is heated to a point where it begins to throw off electrons (small negative charges of electricity). These charges remain in the space near the cathode until a positive potential is applied to the plate. When this is done, the negative charges are attracted to the positive plate, causing them to become active, which results in a flow of current between the cathode and the plate at that time.

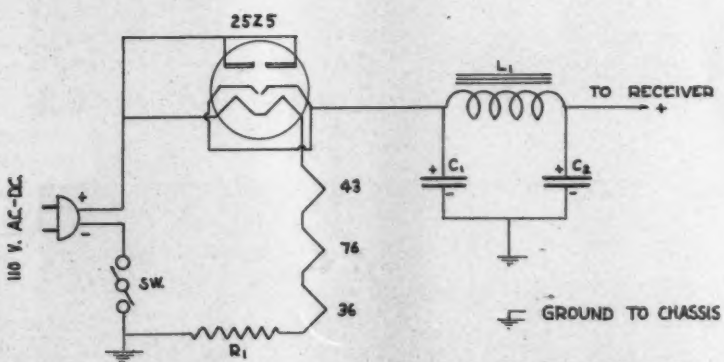


STANDARD 6-CONTACT SOCKET

25Z5 SOCKET CONNECTIONS
BOTTOM VIEW







WIRING DIAGRAM
FOR POWER PACK

Now, considering that the alternating current (or voltage) from the a.c. line has the property of reversing its polarity periodically (see Fig. 1), it can be seen that the plates of the 25Z5 tube will also reverse their polarity periodically; that is, the plates will be positive during one half of the cycle and negative during the other half. Since a current flows through the tube only when the plate is positive with respect to the cathode, the top halves of the waves will be utilized while the bottom halves will be cut off. The resultant current flow through the tube then would be that shown in Figure 2. This is called half-wave rectification.

The 25Z5 is used here in preference to the type 1-V or 12Z3 because of its greater d.c.-output capacity. The other rectifiers mentioned would be operated at overload conditions if used in this set.

Now, the voltage or current flow of the power supply has become pulsating and uni-directional, but it is not a smooth flow, by any means. Thus, the next job is that of smoothing the pulsations into something as uniform as feasible. This is done by means of a filter system containing a network of reactors and condensers.

Consider the filter shown in the diagram of connections. The choke coil here, which is a reactor, offers a high impedance to the pulsation or ripples, while at the same time the two condensers across the line store up electrical energy as each pulsation reaches its peak. The energy thus stored is returned to the line as the pulsation falls toward zero. In other words, the reactor has a tendency to flatten the pulsations from the top while the condensers fill in the valleys, thus smoothing the ripples sufficiently so that they will not cause an annoyingly loud hum in the speaker. The resultant wave from this is represented in Figure 3.

Operation on D.C.

This power supply will operate from a 110-volt d.c. line as well as from a.c. The theory of operation is nearly the same. The supply is plugged into the line so that the plates of the 25Z5 tube are always positive. Thus, a current will always flow through the tube. The armature ripple here is smoothed in the same manner as when used from an a.c. line. The no-load output voltage from d.c. will be a bit lower than when used from a.c.

Selection of Parts

In general, it might be said that the better the grade of parts, the better the results. Of course, higher-grade parts cost more.

Just as important as the grade of parts, is the rating of the parts used in this supply unit. This can stand a little discussion.

It will be noted that the 200-ohm resistor in series with the heaters has a specified rating of 20 watts. This is important. If a resistor of a low rating were used here, it would become overheated and in a short time burn out. It might be mentioned here that at present there is on the market a type of line cord for universal receivers with the series-heater resistor built into it. This arrangement is quite convenient, although it is no more expensive than buying a separate resistor. If one of these cords is bought, it should be the 180-ohm type.

A note concerning the condensers, which are connected at the ends of the choke coil, may be helpful. The 200-volt specification along with these means that the maximum peak voltage they are operating across must not exceed this value. However, the peak voltage of a 110-volt a.c. line is 155 volts, in this case leaving a wide safety margin. As the cost of these condensers increases rapidly in proportion to their voltage rating, there would be no object to using the higher-rated type. Also, these condensers can either be bought as separate condensers or as two condensers combined in one shell. The latter is much more economical, with regard to both price and space requirements.

Construction Notes

As was mentioned during the first part of this article, it may be wise to wire one unit of this set at a time, and test each unit before going on to the next. In this way errors can be easily located and corrected before the wiring underneath the chassis becomes complicated.

To test this unit, connect a 0–150 d.c. voltmeter across the lead marked "to receiver" and the chassis; note the reading when the power supply is plugged into the 110-volt a.c. line. The d.c. reading should be approximately 130 volts.

A suggestive layout plan for the complete receiver will be included in article III of this series. However, there are a few things worth mentioning regarding the layout of power packs. That is, the resistor R and the 25Z5 tube should be kept where there is free air circulation, for these parts dissipate a fairly large amount of heat. For the same reason, these parts should be kept far enough away from other parts that might become harmed from heat radiation.

The ground connections as shown in the diagram of connections are made to the metal chassis. *Under no circumstances should this chassis be connected to an external ground.* Doing this might result in a direct short across the power line, as one side of the power line is already grounded.

All connections should be soldered. Also, rosin-core solder is preferable. It is wise to steer clear of the acid-core type, as this type causes corrosion after a while, and may cause a great deal of trouble in the future.

The cost of this power supply has been estimated to fall somewhere between $2 and $4, depending upon the quality of parts used.

TRAVELING-EXHIBIT CASE

C. R. Dixon, Vocational Director, Ithaca, New York

This so-called traveling-exhibit case was conceived, designed, and built in the industrial-arts department of Ithaca Public Schools. When closed, in the form of a suitcase, it is easily carried from place to place. It can be displayed as shown, or laid out flat on a table or hung on a wall. The sign listing the faculty is ordinarily fastened to the inside of the bottom piece of the case. The various signs indicate by arrows the shop in which the projects on a particular panel were made. The panels are removable so that desirable changes may be made easily. The panels are separated from the case by spacers so that the projects may be fastened to them (a necessary precaution) by wire or screws without marring the case itself. If the method of hinging and fastening the case is not clear from the picture it may be left to the ingenuity of the builder.

This case seems to us an excellent device for exhibiting the work of the shop teacher. It can and has been taken to state meetings, district teacher meetings, local teacher meetings, P.T.A. meetings, shown in local store windows and in various schools in the city.

PERPETUAL CALENDAR

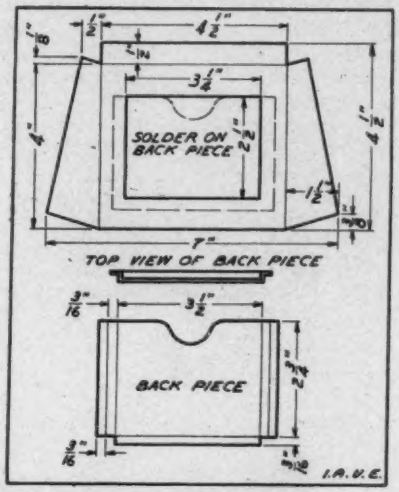
H. J. Reitz and W. F. Jahnke, James Monroe Junior High School, Seattle, Washington

This perpetual-calendar project has served a real purpose in our junior high school in correlating the work of the metal shop and the printshop.

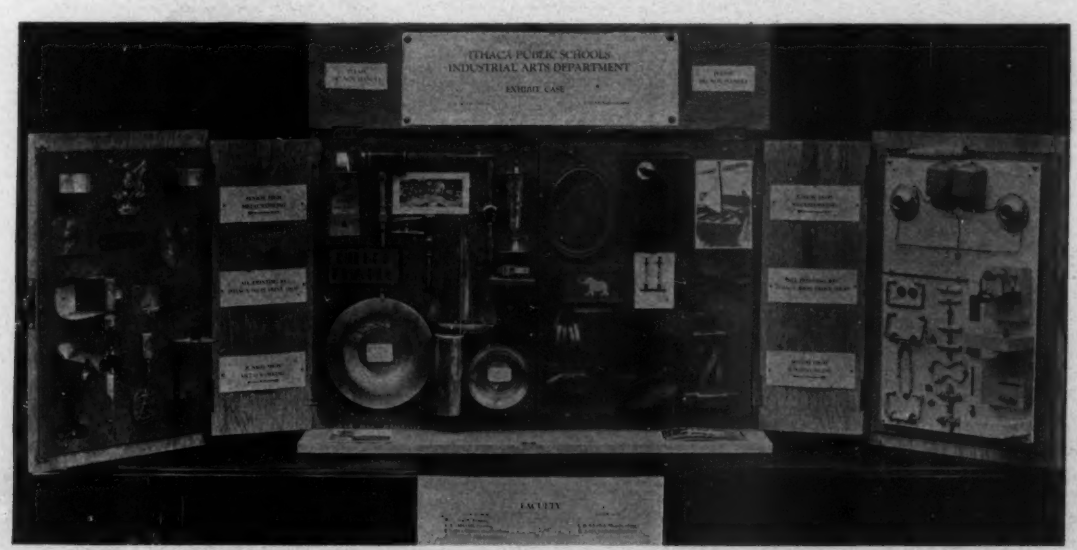
The holder is made of 18-gauge copper, the heavier metal serving the need better than lighter material. It is made of one piece of copper, cut and bent into the desired shape. An additional piece for holding the cards is soldered on the back as is shown in the illustration.

A different peening effect is used on the surface of the metal. The work is done with a riveting hammer, hammering with the lower half edge of the face of the tool, thus giving a half-moon effect. These markings are carried across the calendar in a horizontal line each time.

After finishing and polishing, a protective coat of clear lacquer is applied to the surface.



Perpetual Calendar



Traveling-exhibit case

The preparation of the perpetual-calendar cards provides an interesting project for the printshop. A regular font of foundry type is used to print the cards.

The calendar consists of a set of seven pieces of white index bristol, each 3½ in. wide. The four cards bearing the names of the days of the week and the numbers are printed in black on cards 2⅛ in. high. The three cards with the names of the months are printed in red on cards 2¾ in. high. When one of the latter is placed behind the other cards, the name of the month is visible above the days of the week.

All except one of the smaller cards are printed on both sides. Each impression shows a month beginning on a different day of the week. The larger cards each bear the names of four months, two on each side.

When placed in the calendar holder, the pads are covered with celluloid as a protection from soil.

A COPPER SCROLL PLANT HOLDER

S. H. Puehler, Public Schools, Milwaukee, Wisconsin

Forty-six inches of 3/16-in. copper rod and a piece of 3 by 7-in. 22-gauge sheet copper are the only materials needed for the plant holder, described herewith. Thirty-six inches of rod is used for the scrolls, and 10 in. of rod for the circle in which the flowerpot rests.

The material for the base is cut diamond shape, and the center portion is raised by stretching the metal. This is done by striking the underside of the copper along a line scribed ½ in. from the outer edge, using a dull or slightly rounded cold chisel and a hammer.

The parts are fastened together with solder, after which the entire project is cleaned with emery cloth or steel wool and protected with a coat of clear lacquer. Barium sulphide and water may be used to give an oxidized finish to the copper, if that is preferred to the natural copper finish.

Copper plant holder

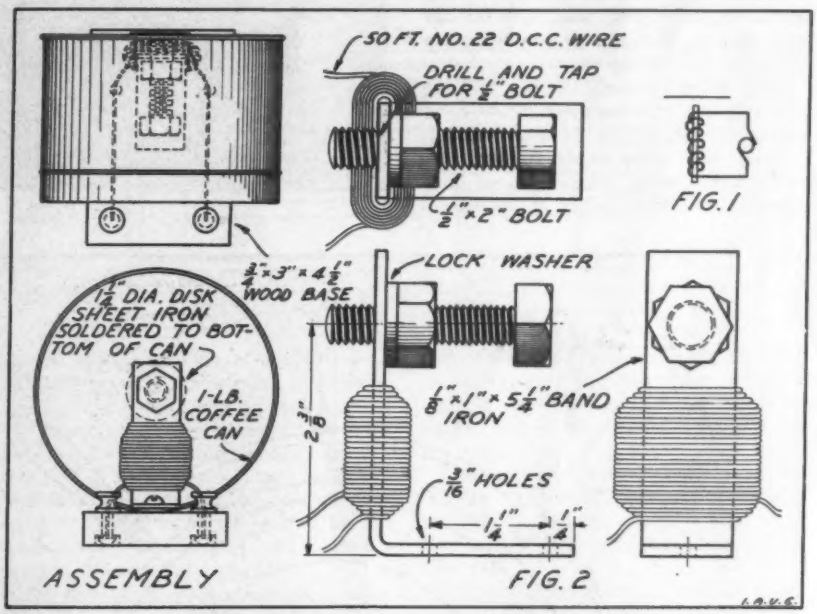
AN ALTERNATING-CURRENT BELL OR BUZZER

Byron M. Taylor, La Mesa, California

A useful alternating-current bell[1] can be constructed from a few, easily obtainable materials. For instance, an ordinary 1-lb. coffee can serves for the case and sound diaphragm of the bell described herein. The bottom of the can is made to vibrate under the varying field of the electromagnet placed in front of it. Figure 1 symbolizes the electric and magnetic circuits used.

[1]All rights reserved by author.

Alternating-current buzzer



In Figure 1, the magnet core has a distance-adjusting screw which in this case forms one of the poles of the magnet itself. To make the core, bend a piece of band iron, ⅛ by 1 by 5¼ in. to the shape shown in Figure 2. Drill the two holes for the holding-down screws, and drill and tap for the ¼-in. bolt.

In Figure 2, the outline of the coil is shown in dotted lines. About 50 ft. of No. 22 d.c.c. magnet wire is used in the bank-wound coil, and about 9 in. of the wire is left at each end for making connections and handling. A *bank-wound* coil has no end pieces to counteract the tendency of the wire to slip off at the ends. Therefore, when beginning a new layer, drop a half turn. Do not try to wind on top of the last turn, but begin the new layer by winding its first turn between the last two turns of the layer underneath.

Prepare the coffee can for use by soldering centrally on the bottom (outside) a disk of sheet iron 1¼ in. in diameter. Then lay the can on its side and set up the assembled magnet inside the can so that the end of the bolt touches the bottom of the can. Mark the can through the holes in the core base, remove the magnet, and punch the holes in the can.

The bell is shown with a ¾ by 3 by 4½ in. pine base. Place the can on the base as shown in Figure 3. This leaves space for the terminal posts. With the holes in the can on the center line of the base, mark positions for holes corresponding to the holes in the can. These holes in the base should be countersunk on the underside to receive the nuts on the holding-down screws. Before fixing the can to the base, punch two more holes through the walls of the can, ¼ in. diameter, one on each side of the coil. These holes, with the coil leads through them, can be seen in the top view, shown in Figure 3.

Now, secure the core, the can, and the base together with two No. 6 by ¾-in. machine screws.

Fit terminal posts on the forward part of the base. Having brought the coil leads through the holes in the can, make connection to the posts. It is well to have sleeving cover the leads from coil to post.

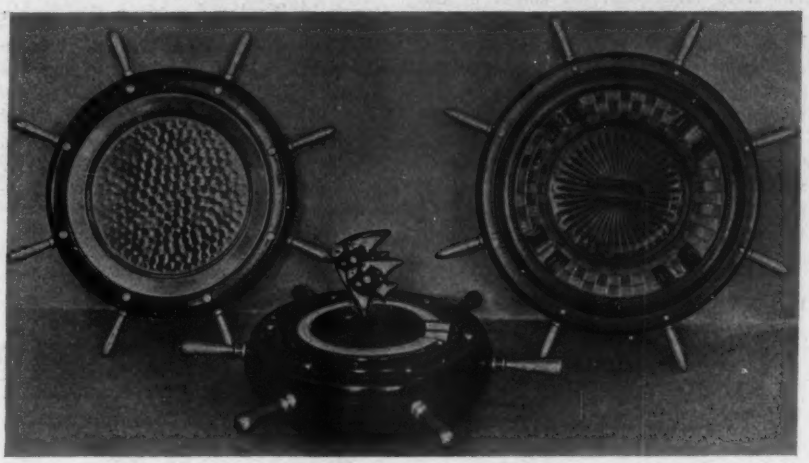
Lacquer the case and can in suitable colors.

Place in operation by connecting into a 6-volt a.c. bell-ringing circuit, using a switch to control the action. Adjust the end of the bolt for best operation and make it permanent by tightening the lock nut.

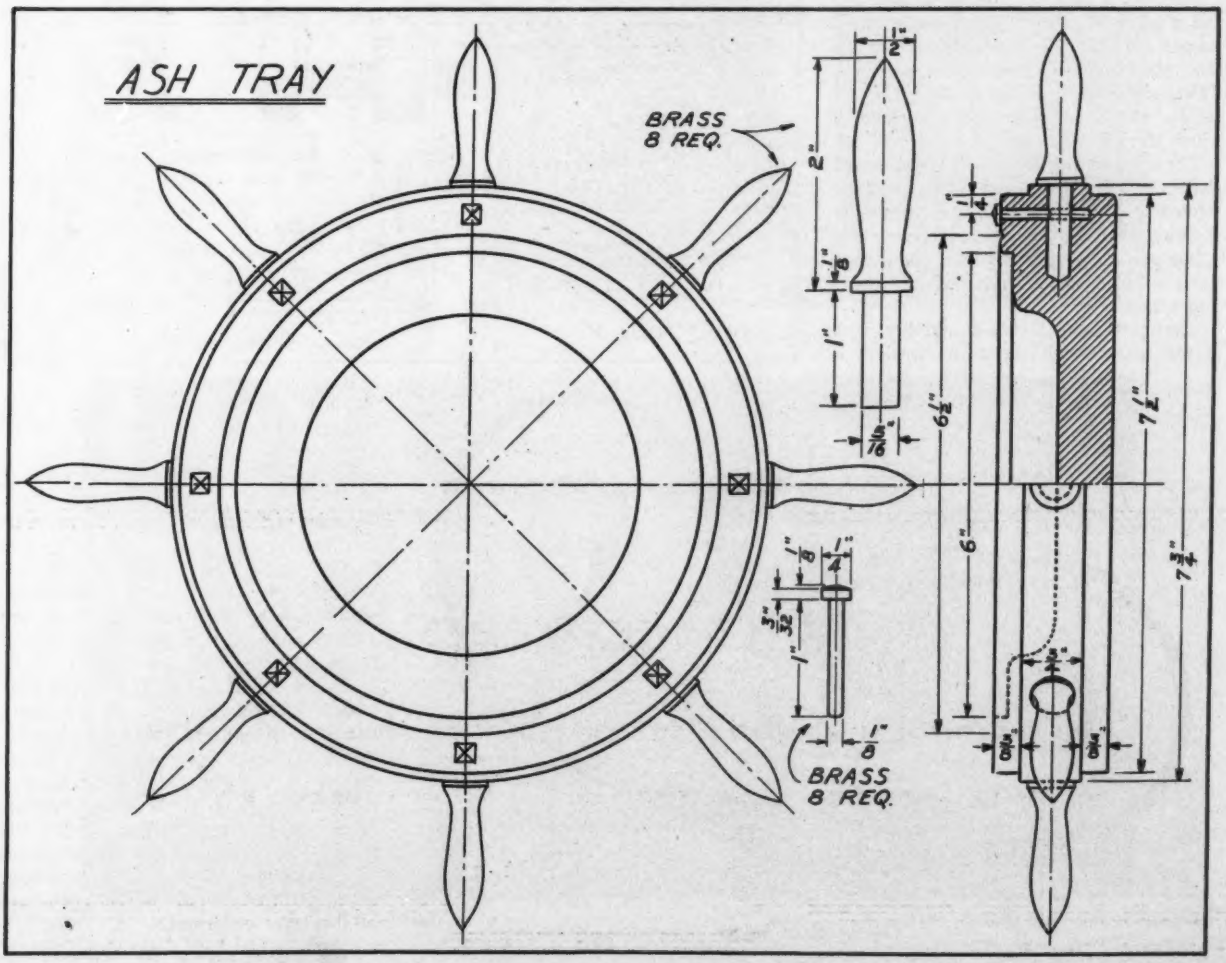
MARINE ASH TRAY

Nelson Iafrate and William Drozdowski, Students
Clifford L. Yard, Instructor,
Junior-Senior High School,
Hastings-on-Hudson, New York

Wood turning is one of the most interesting activities carried on in our woodshop. It is a real hobby for many men who



Marine ash tray



have spare time after working hours, as it gives them an opportunity to make many useful novelties of wood, soft metals, and synthetic resins for presents, household furnishings, and toys for the children. This particular novelty would make an excellent gift for any seaman or person who likes maritime "gadgets."

The wood used in the ash tray shown is walnut cut from an old walnut crotch which had been stored away for a number of years. The wavy figure of the grain finished up most beautifully when given a natural finish. Other woods suitable for such projects are hard maple and cherry which turn nicely and finish beautifully.

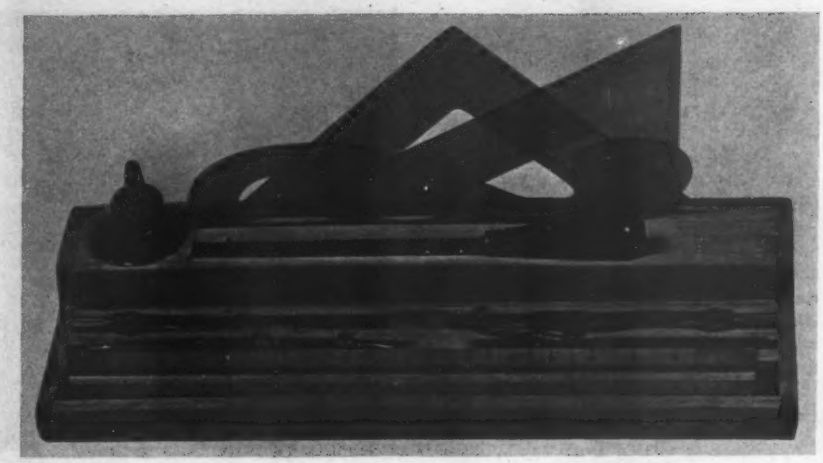
The hand spindles for the ash tray are made from ⅜-in. diameter brass rods which were put into a chuck and filed to shape while rotating on the wood lathe. After filing them to shape, they were polished with fine emery cloth, steel wool, pumice, and rottenstone. The high polish was preserved by dipping them in clear lacquer. The pins for holding the hand spindles are made of 3/16-in. square brass rod or from ¼-in. round brass rod. They were shaped and polished in the same manner that was used on the hand spindles.

The ash tray may be bought or, better still, made of brass or copper. If a commercial tray is to be used, it should be secured before turning the interior of the base. In the working plans, the interior dimensions are omitted as they will be determined by the size of the tray that is to be used. The most pleasing combination for walnut seemed to be a brass tray, hand beaten, to match the other brass attachments. An amber glass tray also goes well with walnut.

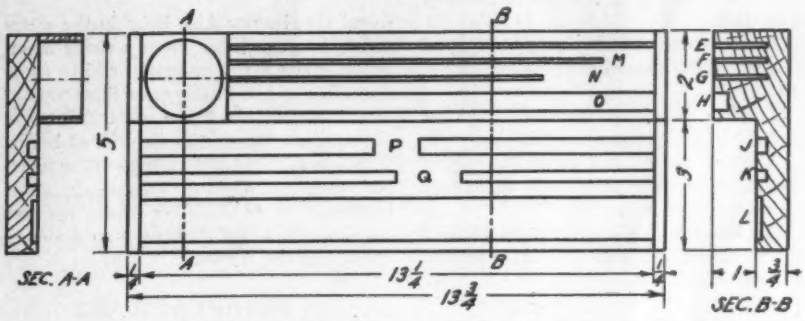
TRAY FOR DRAFTING INSTRUMENTS

P. G. Frasier, Director, Industrial Education, Burlington, Iowa

To an instructor of drafting who has had to check drafting instruments in and out to a large number of students each period of the day, the problem of accounting for such instruments becomes an item of importance. Many systems have been tried in our schools with questionable success, much waste of time, and some loss of valuable instruments. An attempt was made to develop a tray for holding instruments in such a way that they could be checked accurately at a glance.



Drafting-instrument tray



The tray illustrated herewith was evolved after some experimentation, and has been used with great success for a period of four years. The tray is inexpensive to construct, occupies but little space, is convenient to handle, can be checked in an instant, and contains all the essential drafting instruments, including the ink bottle.

This tray is made of white pine, but any suitable wood may be used.

Method of Procedure

1. Square the piece of wood to 1¾ by 5 by 13¼ in.

2. Cut saw kerfs at E, F, G, and H, to accommodate the following instruments: E, 45-deg. triangle; F, 30–60-deg. triangle;

FOR YOUR BULLETIN BOARD

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SELF-CONTROL

Self-control is essential to participation in any organized activity whether play, shopwork, or any other activity.

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Submitted by Professor L. M. Roehl, Cornell University, Ithaca, New York

G, French curve. Make cuts full length of the block.

3. Set the dado head at the proper width and depth to accommodate the tack-lifter blade, and make cut full length of the block. Cut H.

4. Set the dado head at the proper width and depth to accommodate the body of the compass and dividers and make cut J.

5. Set the dado head at the proper width and depth to accommodate the ruling pen and compass extension bar and make cut K.

6. Set the dado head at the proper width and depth to accommodate the scale and make cut L.

7. Setting the block on edge, complete the 1 by 3-in. step cut.

8. Remove material on left end of second step to receive the ink-bottle block.

9. Make and insert ink-bottle block.

10. Form the ¼-in. end pieces and glue in position.

11. Fit blocks in saw kerfs at M and N, and in dado-head grooves at O, P, and Q.

12. Shape slots to receive tack-lifter handle, and the compass and dividers.

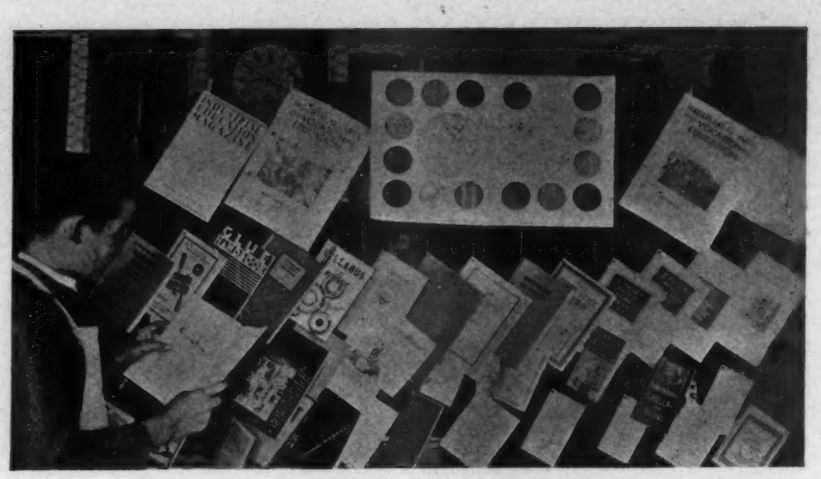
13. Stain to suit, but avoid the use of varnish which would interfere with the free use of the various cuts.

Exact dimensions are not given because of the variation in sizes of instruments of different makes.

DISPLAYING VISUAL-AID MATERIAL

H. L. Stiles, High School, Nogales, Arizona

Many manufacturing companies throughout the country are sending out printed material which contains valuable information for industrial-arts classes. This material is supplied in books and pamphlets of many shapes and sizes, which makes it rather difficult to display and issue to students. After trying many schemes, we found that by punching holes in the material and suspending it from a string about 18 in. in length the material could be made accessible to the students for inspection at all times. We also found that it lessened the danger of losing the material or having it misplaced. Frequent changes in the material were necessary to keep the students interested. Some duplicate copies are kept on hand for those students who desire to check out the material.



Display rack for visual-aid materials

A FIREPLACE SET

H. H. Henderson, LaSalle-Peru Township High School, LaSalle, Illinois

The illustrated fireplace set consisting of a stand and four tools, shovel, poker, tongs and brush, makes a practical advanced project for the general metal shop.

As a complete set it is a worth-while addition to any home that has a fireplace; as a project of market value it finds ready sale. The individual members of the set are easily made and are practical jobs for the school shop.

The making of this set comprises a good variety of experiences including design, practical drawing, forging, drilling, tapping, riveting, peening, raising, and polishing.

The material used is ¼-in., ⅜-in., ½-in., and ⅝-in., square C.R.S. Some 18- and 20-gauge black sheet iron also is required.

Probably the most difficult part of the set is the two-piece handle used on all pieces except the brush. This larger handle with the upset head, together with the twist on each tool, adds a great deal to the design. In forming the heavier end it is best to do the upsetting on the end of a long piece of stock, clamping it in a heavy machine vise. The handle may then be sawed off to length after it has been completely formed. The connection of the handle to the stock offers careful work in locating centers of ends, drilling holes and tapping. The drilling can be done on the drill press or on the lathe.

The brush is hung at the back of the stand by means of a U-shaped hook. The shields by which the brush is held to the handle may vary in shape according to the

FOR YOUR BULLETIN BOARD

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JUDGMENT

Good judgment enables a workman to make wise decisions. It is essential to economy of time and materials and in the direction of one's physical and mental energy.

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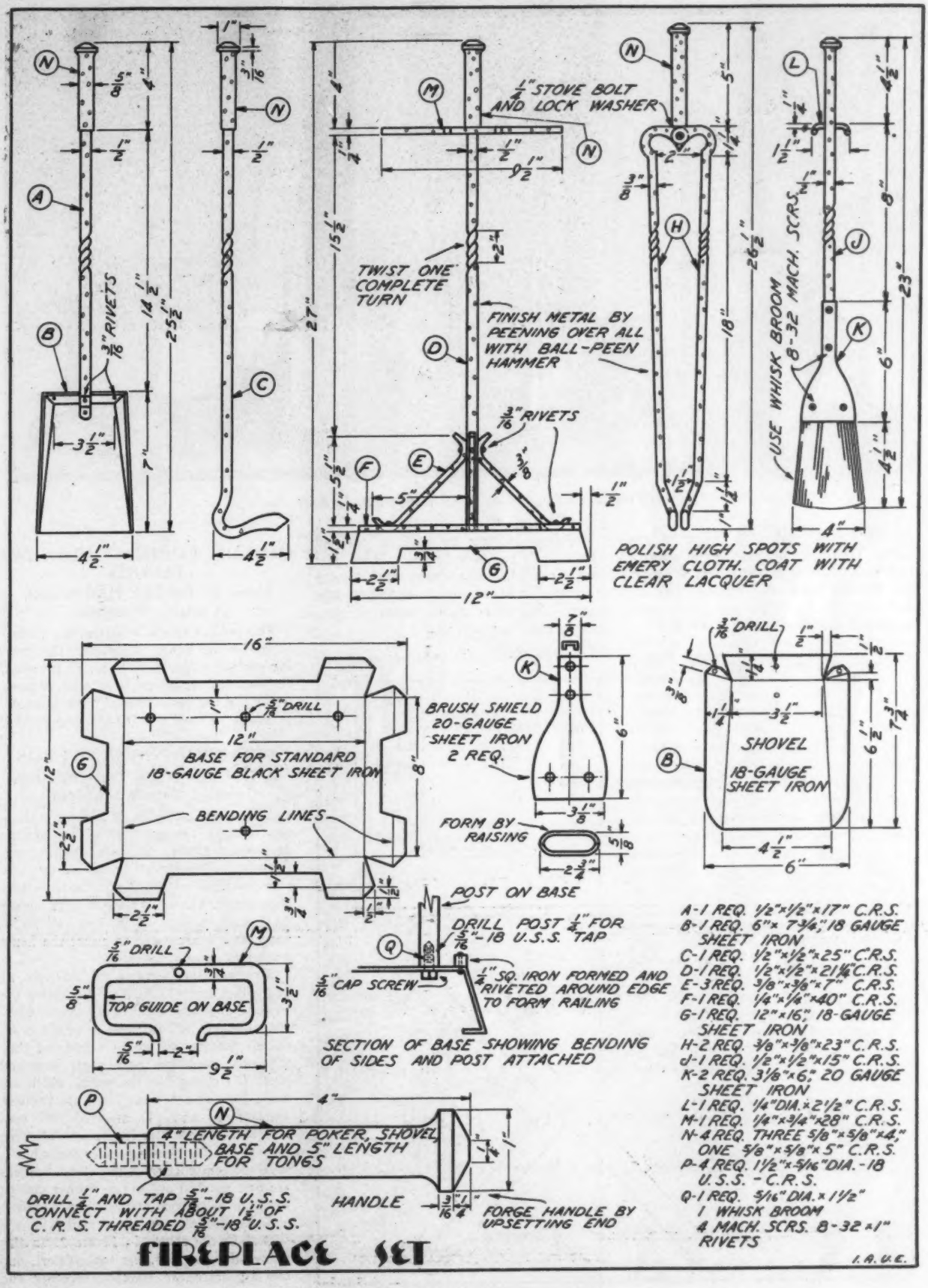
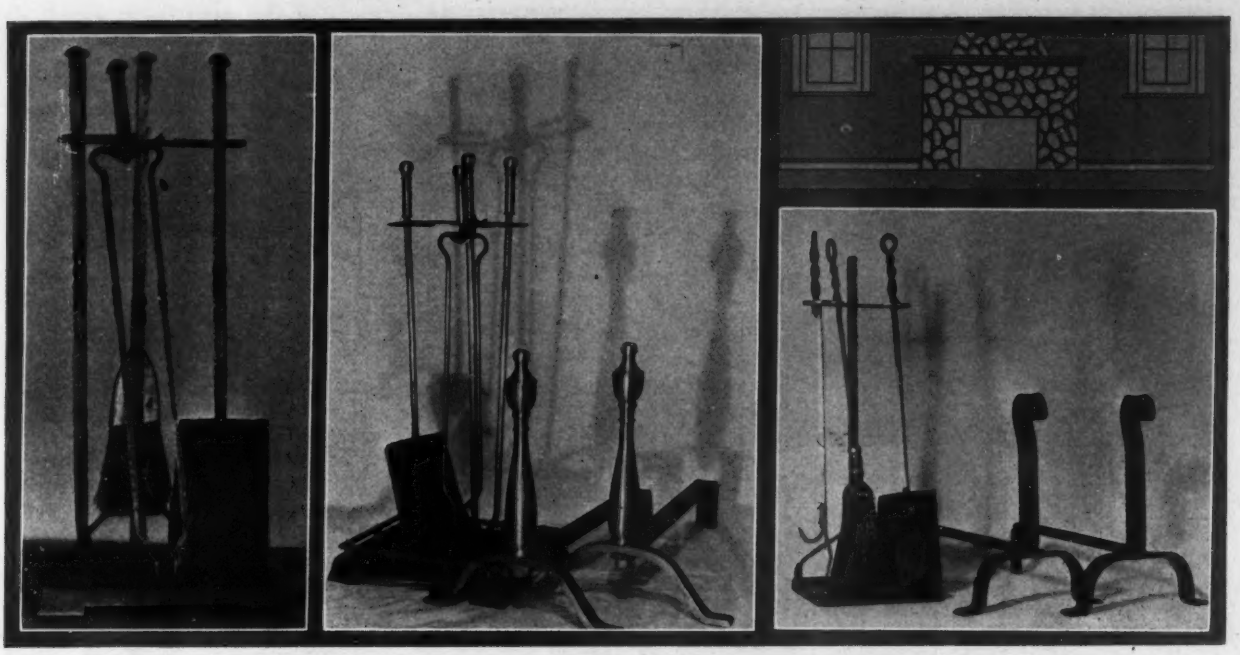
Submitted by Professor L. M. Roehl, Cornell University, Ithaca, New York


1" STOVE BOLT AND LOCK WASHER
TWIST ONE COMPLETE TURN
FINISH METAL BY PEENING OVER ALL WITH BALL-PEEN HAMMER
3/16" RIVETS
POLISH HIGH SPOTS WITH EMERY CLOTH. COAT WITH CLEAR LACQUER
USE WHISK BROOM 8-32 MACH. SCRS.
BASE FOR STANDARD 18-GAUGE BLACK SHEET IRON
BENDING LINES
BRUSH SHIELD 20-GAUGE SHEET IRON 2 REQ.
FORM BY RAISING
SHOVEL 18-GAUGE SHEET IRON
TOP GUIDE ON BASE
POST ON BASE
DRILL POST 1/4" FOR 5/16"-18 U.S.S. TAP
1/4" SQ. IRON FORMED AND RIVETED AROUND EDGE TO FORM RAILING
5/16" CAP SCREW
SECTION OF BASE SHOWING BENDING OF SIDES AND POST ATTACHED
4" LENGTH FOR POKER, SHOVEL BASE AND 5" LENGTH FOR TONGS
DRILL 1/4" AND TAP 5/16"-18 U.S.S. CONNECT WITH ABOUT 1 1/2" OF C.R.S. THREADED 5/16"-18 U.S.S.
HANDLE
FORGE HANDLE BY UPSETTING END

A-1 REQ. 1/2"x1/2"x17" C.R.S.
B-1 REQ. 6"x 7 3/4" 18 GAUGE SHEET IRON
C-1 REQ. 1/2"x1/2"x25" C.R.S.
D-1 REQ. 1/2"x1/2"x21 1/4" C.R.S.
E-3 REQ. 3/8"x3/8"x7" C.R.S.
F-1 REQ. 1/4"x1/4"x40" C.R.S.
G-1 REQ. 12"x16" 18-GAUGE SHEET IRON
H-2 REQ. 3/8"x3/8"x23" C.R.S.
J-1 REQ. 1/2"x1/2"x15" C.R.S.
K-2 REQ. 3 1/8"x6" 20 GAUGE SHEET IRON
L-1 REQ. 1/4" DIA. x 2 1/2" C.R.S.
M-1 REQ. 1/4"x3/4"x28" C.R.S.
N-4 REQ. THREE 5/8"x5/8"x4", ONE 5/8"x5/8"x5" C.R.S.
P-4 REQ. 1 1/2"x5/16" DIA.-18 U.S.S. - C.R.S.
Q-1 REQ. 5/16" DIA. x 1 1/2"
1 WHISK BROOM
4 MACH. SCRS. 8-32 x 1"
RIVETS

FIREPLACE SET

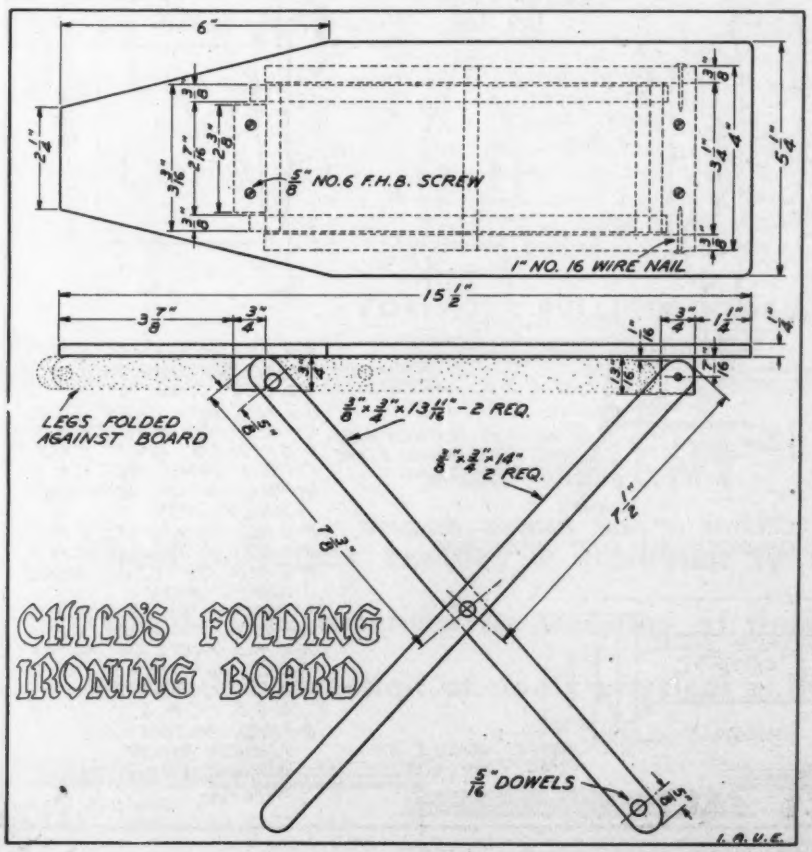
I.A.V.E.



Fireplace set designed by H. H. Henderson, La Salle, Ill.

type of brush used. The shape of the shields is procured by raising the edge of the metal. The handle of the whisk broom used in this brush was removed and the loose ends glued and stitched before being inserted in the shields.

Finishing is done by peening over all with a ¾-lb. ball-peen hammer. High spots are then polished with emery cloth leaving a contrasting bright surface with dark peen marks. This finish can be preserved by a coat of clear lacquer.


6"
5/16" NO.6 F.H.B. SCREW
1" NO. 16 WIRE NAIL
15 1/2"
LEGS FOLDED AGAINST BOARD
3/8" x 3/4" x 13 11/16" - 2 REQ.
3/8" x 3/4" x 14" 2 REQ.
5/16" DOWELS
CHILD'S FOLDING IRONING BOARD
I. A. U. E.

CHILD'S FOLDING IRONING BOARD

Louis F. Barocci, High School, Cudahy, Wisconsin

This project can be a part of the junior- or senior-high-school shopwork. The ironing surface is made of ¼-in. fir plywood, the legs and leg supports of pine or basswood, and the dowel rods of birch or maple. It makes an ideal gift for the young child.

WORKSHOP-BENCH LEGS

D. C. Unger, Cass Technical High School, Detroit, Michigan

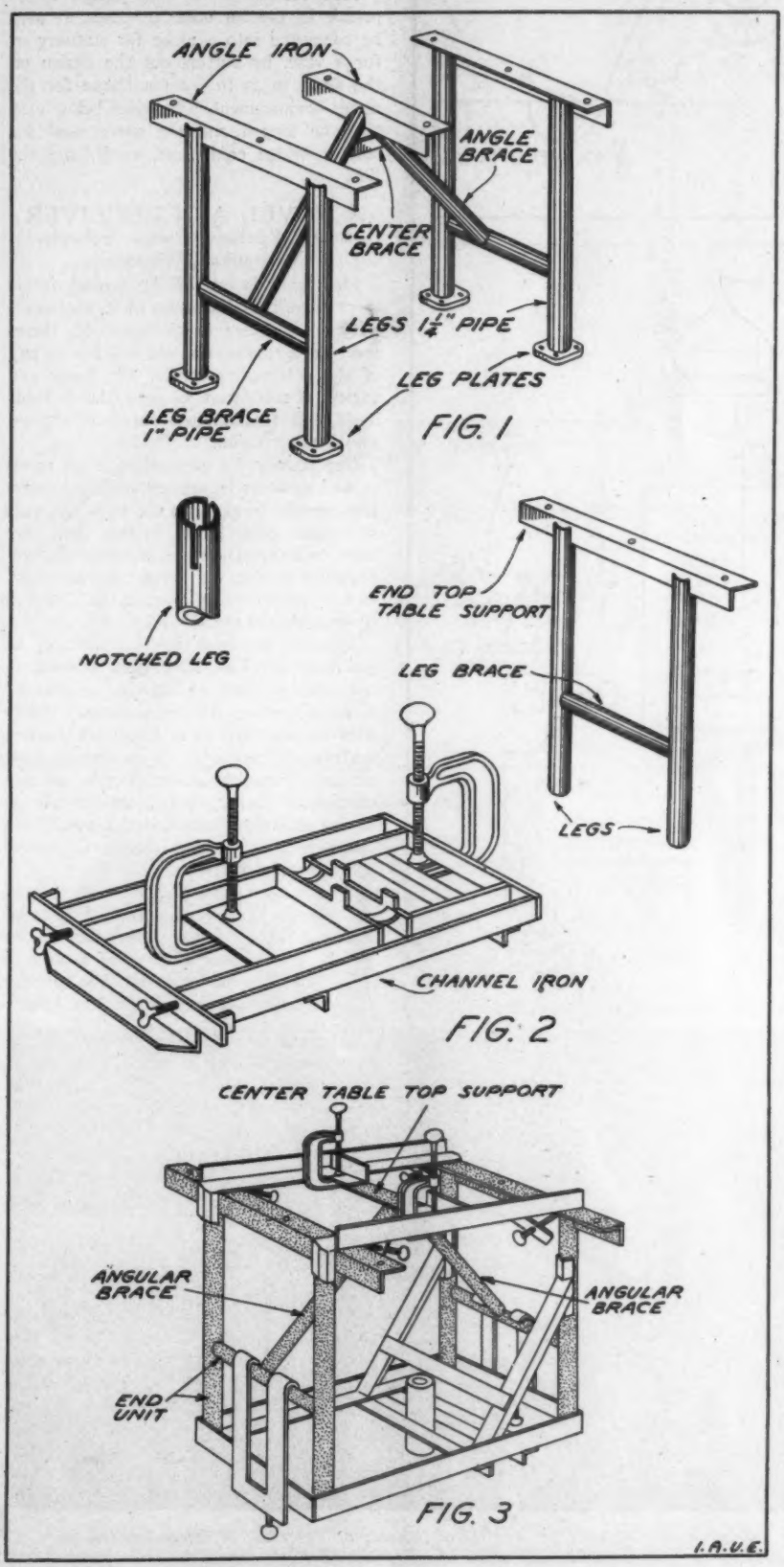
After some study in developing a suitable project for production, the welding department in Cass Technical High School, Detroit, is constructing a sturdy and economical set of bench legs for the workshop bench. The set is illustrated in Figure 1. It is 28 in. high, 25 in. long and 20 in. wide; and is adaptable to either the home workshop or to school use.

Some of the features of this set of bench legs are: (1) rigidity — enabling the legs and angles to stand heavy shocks without springing; (2) lightness — weight is reduced through the use of fabricated construction employing both angle iron and pipe; (3) strength — the welds, which are made with an acetylene torch are resilient and strong; and (4) inverted "V" construction — eliminates low braces, allowing easy access for cleaning under the table.

In the construction of this stand, the legs are first notched at the top, with a cutting torch in a cutting fixture. The complete end assemblies are then made in the special fixture shown in Figure 2. In this fixture the two legs, the top support, and the leg brace are clamped together and

Bill of Material

2 pc.	1½ x 1½ x	¼ x 20	Angle iron	Top	2 pc.	1¼ x 23	Wrought-iron pipe	Angular braces
1 pc.	1½ x 1½ x	¼ x 12	Angle iron	Center	2 pc.	1 x 13½	Wrought-iron pipe	Leg braces
4 pc.		¼ x 27¾	Wrought-iron pipe	Legs	4 pc.	3 x ¼ x 3	Flat steel	Foot plates
					1 pc.	¼ x 1 x 3	Flat steel	Center brace



tack-welded, the end is then taken from the fixture and finished welded on a bench.

The second operation is the welding of the angular braces, the center table-top support, and the short center brace to the end units. This operation has its own fixture, Figure 3. In this fixture, first the angular braces are welded at the lower end, next the small cross brace, and last the joint formed by the two angular braces at their connection to the center table-top support. Distortion due to welding is eliminated by first tacking the joints to be welded, thus allowing for expansion in the final joint at the top. Distortion is also avoided by the series of fixtures used throughout the construction.

The last operation is the welding of the flat steel bases to the four legs. In this final step accuracy of alignment to insure a solid structure free from the slightest rocking is obtained by the use of an aligning fixture. Holes in these plates allow the table to be bolted to the floor.

CORNER TELEPHONE CABINET

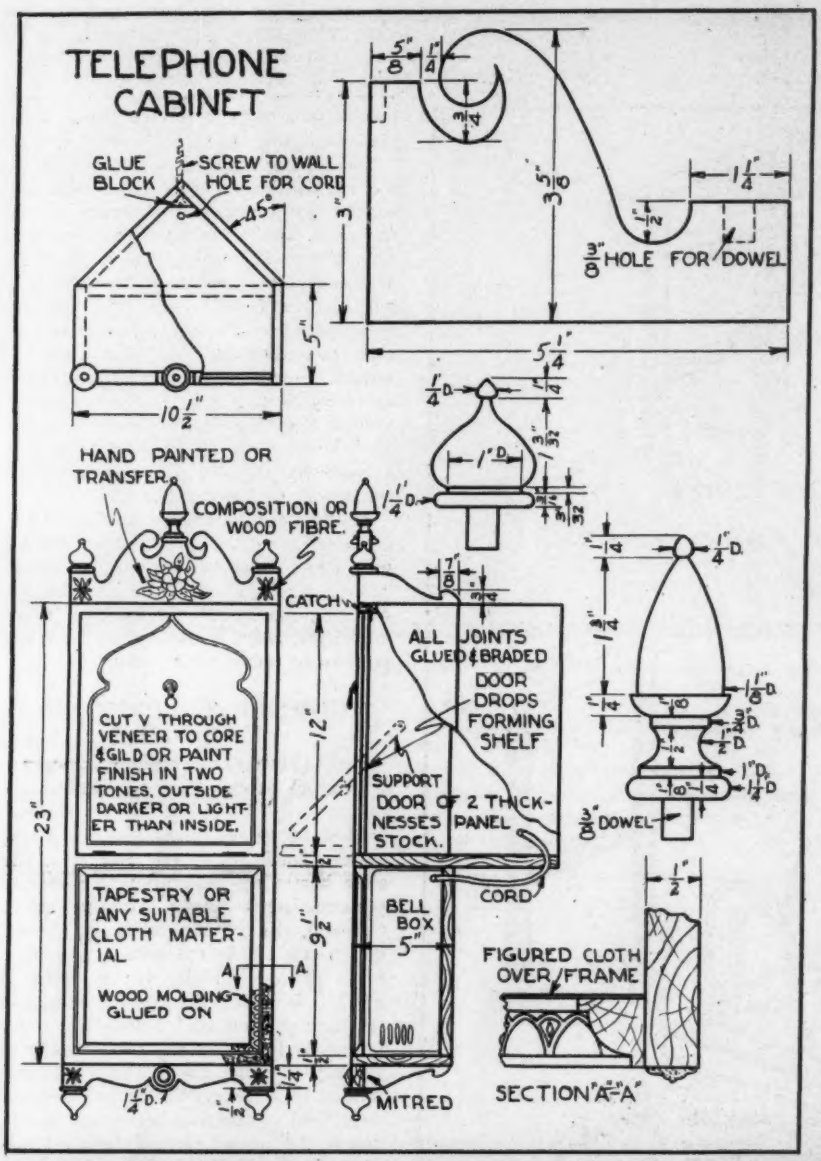
R. M. Hammes, Abraham Lincoln High School, Council Bluffs, Iowa

Most telephones in common use in the modern home are of the desk type, and some homes are equipped with niches to accommodate this phone. For homes not so equipped, this cabinet fulfills all the requirements and at the same time adds a touch of color novelty to any room in which it is placed. Colorful decorations in the form of hand-painted flowers or transfers at the top, and a well-selected piece of tapestry or figured silk of appropriate pattern set in as a panel for the bell compartment, lend an appealing beauty and quaintness to the finished piece. Panel stock may be used as a substitute for the cloth panel. In such cases the panel should be decorated to correspond with the upper section and holes must be bored in the bottom of the compartment to permit the bell to be heard more easily.

The corner rosettes and the knobs on ends of turnings may be gilded or colored to suit the whim of the maker, but the best plan is to have the color harmonize with the color scheme of the room in which the cabinet is to be placed.

The door is designed to form a drop shelf which may be used for writing while at the phone. The bottom panel is held in place with spring catches. If desired, the door to the telephone compartment may be cut in half vertically and hinged as an ordinary double door.

The cabinet proper is made of ½-in. material. The scrolls at top and bottom are of ⅝-in. thickness to permit holes at corners for doweling the turned pieces. Moldings and decorations of wood, compo-



sition, or wood fiber may be purchased from firms handling manual-training supplies.

This cabinet is of such design as to permit its use for other purposes. It may be converted into a niche for statuary or for a vase, by cutting out the design on the door, so as to form a frame for the upper compartment. The panel below may then be hinged and the space used for storing bridge equipment, cards, and the like.

A NOVEL ASH RECEIVER

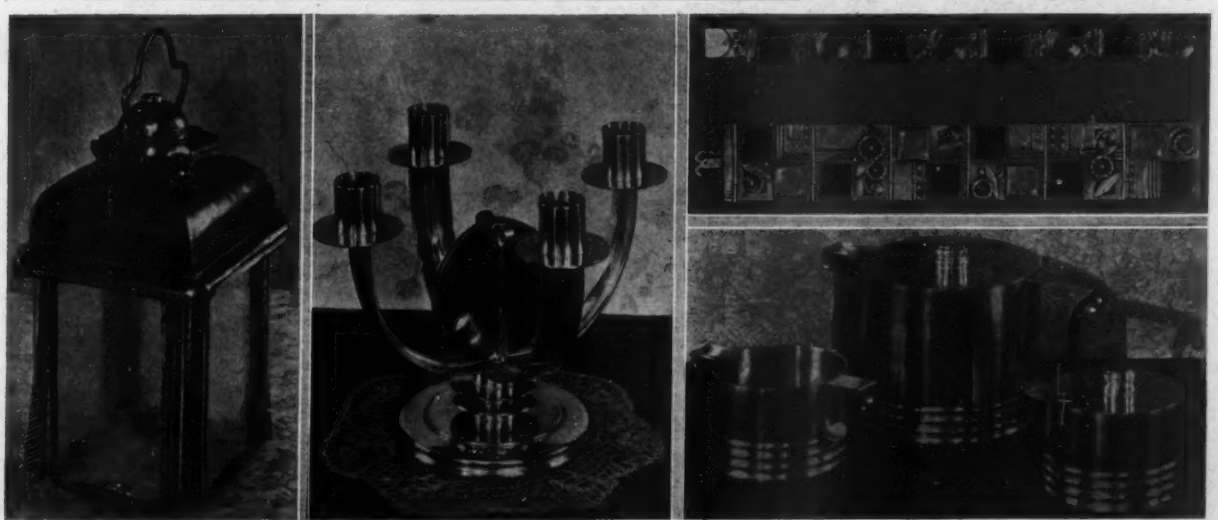
S. H. Puehler, Public Schools, Milwaukee, Wisconsin

Metalwork is one of the earliest forms of craftwork, and samples of it, thousands of years old, are in existence. It, therefore, has a tradition as old and fine as any of the outstanding crafts. The range and variety of metals are so great, that it lends itself well to numerous forms of expressional construction.

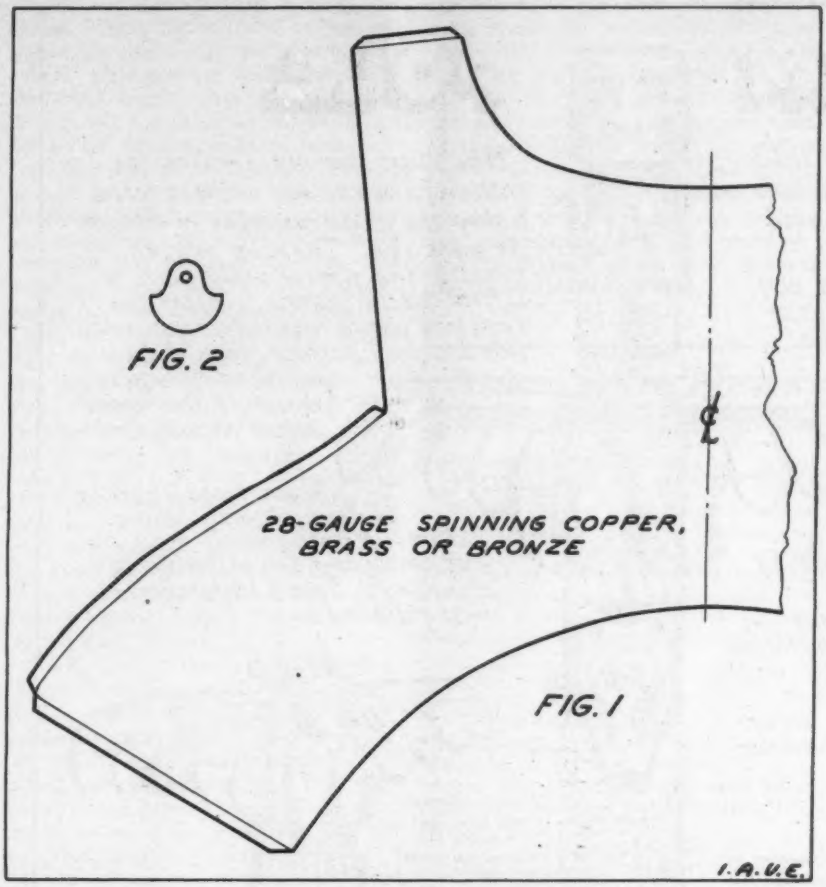
Opportunity for expression in art metal as well as other laboratory subjects, therefore, should be given to the boys and girls of various grade levels, so that they may learn to make things out of metal that are beautiful in line and form, and useful, as well as imitative of the art of the historical silversmith and metalworker.

Modern processes in the working of metal by machine have been devised in the past century to satisfy commercial demands, but we are here concerned chiefly with metals adapted to handwork from a craftsman's viewpoint. Of the metals most extensively used in art-metal craft, we may enumerate copper, brass, and bronze as having desirable characteristics which lend themselves well to the project illustrated and described herewith.

The metal needed for the body of the ash receiver consists of a piece of 28-gauge spinning copper, brass, or bronze, 5¼ by 8½ in. The bottom is made of a piece of 3 by 3-in., 20-gauge material. The wire for the lift and handle is 8-gauge, 9 in. long.



Metalwork which won prizes at the Industrial-Arts Exhibit of the Public Schools at Paterson, N. J. Submitted by Norman A. Crow, instructor in cabinetmaking and wood turning, Central High School



Full size pattern

Coal-scuttle ash receiver

Trace the pattern shown in Figure 1 full size on a piece of paper. Cut out this pattern and transfer it to the sheet of 28-gauge metal. Cut to line with tin snips. File any uneven irregularities extending beyond these lines. Bend over the upper edge of the back half of the body with a piece of 3/16-in. metal rod slotted 1/16 in. deep. This is to form the rolled edge. Hammer down lightly and file to smooth out any imperfections. Form locking seam on back and top of pouring spout with the same tool. Bend metal into cylindrical shape over round pipe. Hook, flatten, and lock both seams with a grooving tool. This tool may be made of 3/16-in. round stock. It should have a groove ⅛ in. wide and 1/16 in. deep at its end. The bottom of the formed piece should then be filed so it sets perfectly flat.

A circle of 2½-in. diameter is drawn on the stock for the bottom. Cut to shape and file to line. With a piece of 3/16-in. round metal rod slotted ¼ in. deep, bend the edge of bottom to the desired shape. Bend only a small amount at a time and go around the circumference several times. If carefully done, there will be no buckling. File and smooth out any imperfections.

Next, wire bottom and body of the ash receiver together, and sweat the two together by heating over a flame. Cut handle holders to desired shape. Figure 2 shows them full size. Drill the holes in the holders slightly larger than the wire used for the handle. Sweat handle holders to side of ash receiver. Bend the handle wire to correct shape and slip into handle holders. Bend handle lift to desired shape and sweat in place. Cut, bend, and sweat cigarette holder on top of pouring spout. Clean and polish with fine emery powder. For the final finish, use wax, lacquer, or varnish.

Answers to Questions

WHITE AND SILVER EFFECTS ON CHRISTMAS TREE

1017. Q.: Can you give me information on the materials, sources of materials, and instructions for using materials in finishing Christmas trees to produce the white-tree effect? — *M. H.*

A.: Reduce an inexpensive grade of oil-body wall paint, egg-shell type, with at least an equal volume of gasoline. Spray on a light coat and let dry; if not sufficiently dense, repeat after two hours' drying.

For the silver effect, use a prepared grade of silver or aluminum radiator paint and reduce enough with gasoline or turpentine, or both, for good spraying consistency. A wide fan-type of spray is the best for this work. Let dry out of doors to remove all traces of paint smell. — *Ralph G. Waring.*

SHELLAC, VARNISH, LACQUER — WHAT?

1015. Q.: Will you please outline a method of detecting whether shellac, varnish, or lacquer has been used in the finishing of a given piece of work? — *W. B. H.*

A.: It is easy to distinguish between a shellac finish and one of varnish, in that the former is easily removed from an applied surface by a rag wet with alcohol, whereas varnish is little, if at all, affected. To test a dry surface, only experience as to the physical appearance is of much help, al-

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TOTEM POLE

Pole should be about 10" or 12" thick at butt end and from 10' to 14' long depending on where it is to be used and the material available.

If a bass or pine log is used, peel off bark & trim away any bumps or irregularities with a drawknife.

If an old telephone pole is used, cut away the gray or weathered outside layer with a drawknife. Large checks or cracks may be filled with strips of wood or putty after carving is completed.

Decide what symbols or designs you wish to use and lay out each section full size on wrapping paper or on a blackboard. A better plan is to whittle a small model first, using a piece of pine one inch in diameter.

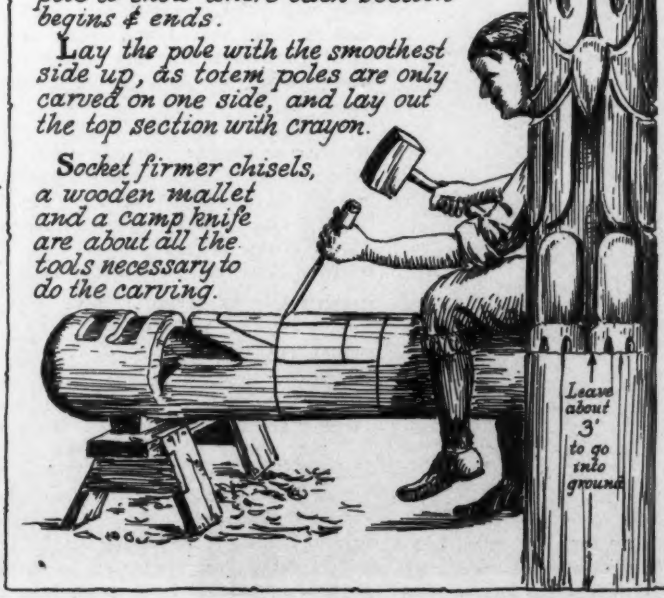
Place the pole on horses or blocks about 2' from the ground and

block it with wedges to prevent it from rolling.

With a soft pencil or a piece of crayon draw a line around the pole to show where each section begins & ends.

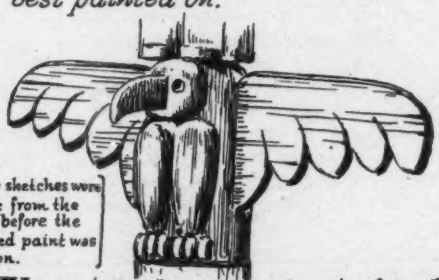
Lay the pole with the smoothest side up, as totem poles are only carved on one side, and lay out the top section with crayon.

Socket firmer chisels, a wooden mallet and a camp knife are about all the tools necessary to do the carving.



Now start carving. Outline the section to be cut out with a chisel using the same number of blows for each cut. Then by prying gently, the waste wood may be lifted out in layers. After the required depth has been reached the lowered surface should be smoothed down nicely & the raised edges should be rounded off.

Where large lettering is used, it may be cut out or the background may be cut away and the lettering left standing. Small lettering is best painted on.



These sketches were made from the pole before the colored paint was put on.

Wings & beaks are cut out of inch boards and are set into mortises about 2" deep. Nails driven at angles from both sides will hold them in place.

Pieces accidentally broken out may be given a coating of white lead and fastened back in place with thin finishing nails.

If two boys wish to work at the same time, lay out the top and middle sections, and each may work downward without interfering.

To finish, give the pole a priming coat of white paint and then paint the entire pole with colored paints to suit, thus giving it two coats overall.

Added ornamentations may be painted on, as for instance, eyes, teeth, feathers, etc.

For colors, use black, brown, red, blue, green and yellow with a little white here and there to form a contrast.

Plate by W. Ben. Hunt
Hales Corners, Wis.

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though I have demonstrated to my own satisfaction that a moistened thumb, when rubbed with pressure and vigor on a shellacked surface gives a characteristic odor of both shellac and alcohol which cannot be had from a varnished surface.

On the other hand, I believe there is no sure method which will enable a shop teacher to distinguish between varnish and lacquer coatings, especially when the latter has dried for any length of time. The moistened-thumb method will give a typical lacquer odor on lacquer surfaces less than a year old and none on standard varnish types. On the other hand, a typical furniture lacquer such as has been used in the past is less readily attacked by the stronger hydrocarbon solvents than is a typical furniture varnish.

As a result, it is quite possible that a distinction could be made by rubbing the finish with a cloth saturated with toluol, sylol, or a high-flash naphtha of coal-tar-base type. Such solvents would make the resins in the varnish film soft and sticky, while a typical lacquer film would be affected little, if at all.

Due to the fact that lacquers are being formulated along so widely variable lines, as compared to past practice, it is impossible to make any safe generalizations. One of the most radical changes is the inclusion of substantial amounts of drying oils, something unheard of a few years ago; and of late many are being formulated on the oxidizable glyceryl phthalate resins.

In the last analysis, the next best thing for shopmen to do, is to make up sample panels, covered with as many typical commercial coatings as time and money will permit, sanded, rubbed, and polished in each case. In this way they may in some measure attain both experience and judgment as to the appearance, depth, luster, transparency, as well as the sanding and rubbing properties of these several materials. — *Ralph G. Waring.*

REFINISHING A BLACK-WALNUT GUNSTOCK

1020. Q.: I wish to refinish a five-year-old black-walnut gunstock. Sweat and exposure have caused the grip of the stock to turn dark. I would like a high glass-smooth, waterproof finish. — *O. B. D.*

A.: Sand the stock to clean, bright wood. Stain with a water-soluble walnut stain. Dry overnight. Seal with a high-grade 4-hour varnish cut in half with turpentine and let dry hard in a warm room overnight. Sand level and smooth with a split 6/0 paper. Dust off and fill with a walnut-colored silex filler; wiping clean and level. Allow the filler to dry for a day or two.

Brush on a full-bodied coat of the varnish and let dry 48 hours. Sand with a split 6/0 paper and revarnish. Let dry one week and then rub with FFF pumice, crude oil, and hard felt. This will produce a hard, tough, and reasonably thin finish which will bring out the best in the wood but will almost outwear the gun. Do not be misled by talk from the neighbors and other gun "experts" that all the manufacturer uses is "a coat or two of linseed oil, well rubbed in." It so happens that I give technical service to some of these same firms, so that you may rest assured that the above recommendations are based on sound technical practice. — *Ralph G. Waring.*

Association News

ANNOUNCE PROGRAM FOR A.V.A. CONVENTION IN SAN ANTONIO

President George P. Hambrecht has announced the completion of the tentative program for the convention of the American Vocational Association, to be held December 2 to 5, in San Antonio, Tex. The sessions will be held in the Plaza, Gunter, and St. Anthony hotels and in the Bexar County Courthouse.

THE PROGRAM

General Meetings

Wednesday, December 2

Speakers will be Governor James V. Allred, State Supt. L. A. Woods, Mayor C. K. Quin, Director Ray L. Martin of the State Vocational Department, and George P. Hambrecht, president of the association.

Thursday, December 3

Annual banquet. Mr. George P. Hambrecht, Madison, Wis., toastmaster.

Friday, December 4

Chairman, Mr. George P. Hambrecht.

Reports of the secretary, treasurer, and committees.

Program of The Ship.

Group Meetings. Theme: *Vocational Education — A Vital Service to Youth.* Chairman, Arthur K. Gettman, state supervisor, Albany, N. Y.

National Council of Local Administration of Vocational Education. President, Herb Heilig, Appleton, Wis. Joint meeting with local supervisors of industrial arts. Conference on local administrators' problems.

Sectional Meetings

Wednesday, December 2

Agricultural Education

Chairman, Mr. R. M. Stewart, Cornell University, Ithaca, N. Y. Panel discussion: Research Problems Suggested by Curriculum Exhibit. Chairman, Mr. F. W. Lathrop, U. S. Office of Education, Washington, D. C.

Teacher-Training Subsection

Chairman, Mr. L. D. Klemmedson, College of Agriculture, Tucson, Ariz. Topic: *Organizing Teacher-Training Programs to Meet New Conditions.*

The Cadet System of Training Vocational Agricultural Teachers, Mr. S. S. Sutherland, Davis, Calif.

National Association of State Supervisors

Chairman, Mr. S. M. Jackson, Baton Rouge, La. Discussions: Five-Year Plan. J. E. Border, Bozeman, Mont.; E. B. Matthew, Little Rock, Ark.; L. M. Sasman, Madison, Wis.; J. A. Linke, U. S. Office of Education, Washington.

Thursday, December 3

Ten-Year Teacher Trainers in Agricultural Education

President, Mr. Sherman Dickinson, University of Missouri, Columbia.

Friday, December 4

Chairman, Mr. Roy A. Olney, Morgantown, W. Va. Topic: *Current Problems.* Discussion: I. W. Duggan and W. G. Crandall. *Placement of Vocational Students:* J. B. McClelland, R. H. Woods, and V. G. Martin. Chairman, Mr. J. B. Rutland, Austin, Tex.

Saturday, December 5

Chairman, Mr. R. M. Stewart, Cornell University, Ithaca, N. Y. Topic: *Possibilities for Research Through a National Study of the Secondary Curriculum for Agriculture. Evidences from Curriculum Researches of the Need for Further Studies,* Carsie Hammonds, Lexington, Ky.; *Outstanding Features of the Curriculum Exhibit,* Mr. Sherman Dickinson, Columbia, Mo.; Summary, Mr. F. W. Lathrop, Washington, D. C.; *Looking Ahead in Agriculture,* Mr. A. K. Getman, Albany, N. Y.; *The Agricultural Education Magazine,* Mr. R. A. Olney, Morgantown, W. Va.

Friday, December 4

Agriculture Teachers' Subsection

Chairman, Mr. C. B. Barclay, Bryant, Tex. *Vocational Agriculture Supervision Problems,* Mr. F. E. Wimberly, State College, N. Mex.; *Teacher Training in Vocational Agriculture,* Mr. R. L. Davenport, Baton Rouge, La.; *Trends in Agricultural Education,* Mr. D. M. Clements, Washington, D. C.

Saturday, December 5

Some Problems of Future Farmer Advisers, Mr. Claude Fry, Polo, Ill.; *The Future of Education in Agriculture,* Mr. E. J. Kyle, College Station, Tex.; *Developing Programs of Supervised Practice in Farming,* Mr. S. V. Burks, Poteet, Tex.

Thursday, December 3

Commercial Education

Chairman, Mr. P. H. Nystrom, Columbia University, New York, N. Y. Topic: *Training for Workers in Distributive Occupations.*

Friday, December 4

Chairman, Mr. N. S. Hunsdon, San Antonio, Tex. Topic: *Training for Teachers of Distributive Occupations.*

Saturday, December 5

Chairman, Miss Bess H. Stratton, San Antonio, Tex. Topic: *Business Education in Secondary Schools.*

Friday, December 4

National Youth Administration and WPA

General Chairman, Mr. C. L. Greiber, Madison, Wis. Topic: *Adult Education Program Under the WPA.* Chairman, Mr. L. R. Alderman, Washington, D. C. Topics: *The Objectives of the WPA Education Program. A State Works Progress Education Program,* Mr. J. E. Jackson; *Problems in Training Works Progress Administration Education Teachers,* Mr. H. C. Thayer, Madison, Wis.; *Co-ordination of WPA Education Program with Future Farmer Adult Education Programs,* Mr. George P. Hambrecht, Madison, Wis.

Chairman, Mr. John H. Lasher, Madison, Wis. Topic: *A Program Combining Education With Labor Through Youth Works Projects. The Objectives of National Youth Program,* Mr. John Randall, Washington, D. C.; *Problems of Guidance and Placement,* Miss Mary Hayes, Washington, D. C.; *The State Na-*

tional Youth Administration Program, Mr. Lynden Johnson, state director of Texas.

Friday, December 4

Vocational Guidance

Chairman, Mr. G. F. Myers, University of Michigan, Ann Arbor. *The Scope of Occupational Adjustment,* Mr. Edwin A. Lee, New York, N. Y. Panel discussion: *What Place Have Vocational Teachers and Teacher Trainers in a Comprehensive Program of Vocational Guidance?* Mr. A. H. Edgerton, Madison, Wis.

Saturday, December 5

Chairman, Mr. Ray Fife, State College, N. Mex. *What Should the Schools Do in Helping Youth to Get Jobs?* Mr. C. A. Prosser, Dunwoody Industrial Institute, Minneapolis, Minn.; Discussion: *How Should the Schools and Public Employment Offices Co-operate in Placing Youth in Employment,* Mr. W. K. Layton, Detroit, Mich.

Wednesday, December 2

Home-Economics Education

National Association of State Supervisors

Chairman, Mr. L. J. Berry, San Marcos, Tex.

Discussion: *Are Homemaking Programs Meeting Community Needs?* Theme: *The Expanding Program of Home-Economics Education.* Chairman, Miss Lillian Peek, Austin, Tex. *Interpreting Policies and Programs to Best Serve the Needs for Family Life Education,* Miss Florence Fallgatter, U. S. Office of Education, Washington, D. C. Round Tables: Bases for Guiding the Expansion of the Program.

Friday, December 4

Chairman, Miss Bess Heflin, Austin, Tex. Topic: *Research and Experiments to Safeguard the Expanding Program.*

Joint Meeting with National Congress of Parents and Teachers. Chairman, Miss Kathryn V. Burns, Urbana, Ill. Jury Panel discussion.

Saturday, December 5

Chairman, Miss Marie White, U. S. Office of Education, Washington, D. C. Topic: *The Integration of Newer Phases in the Home Economics Program.*

Thursday, December 3

Industrial-Arts Education

Chairman, Mr. Louis V. Newkirk, Chicago, Ill. Topic: *Problems Confronting Industrial Arts.* Discussion: Plans for the future activities of the department.

Friday, December 4

Chairman, Mr. Earl L. Bedell, Detroit, Mich. Topic: *Teaching the Boy in the Junior High School. Developing Desirable Attitudes Through Participating Experiences in the Junior High School,* C. L. Hill, Tulsa, Okla.; *Youth Looks Ahead,* Mr. Elmer W. Christy, Cincinnati, Ohio; *Intangibles,* Mr. Frank C. Moore, Cleveland, Ohio.

Combined Industrial Arts and Trade and Industrial Sections

Chairman, Mr. Paul L. Cressman, Harrisburg, Pa. *Presentation of the Problem,* Mr. Edwin E. Gunn, Jr., Madison, Wis. Panel discussion: Chairman Irvin S. Noall, Salt Lake City, Utah.

Saturday, December 5

Chairman, Mr. DeWitt Hunt, Stillwater, Okla. Topic: *Industrial Arts in the Senior High School. Industrial-Arts Design in the Senior High School,* Mr. O. A. Hankammer, Pittsburgh, Kans.; *Industrial-Arts Adjustment Possibilities and Vocational Education,* Mr. R. A. Hinderman, Denver, Colo.; *Neglected Values in Industrial Arts,* Mr. Arthur B. Mays, Urbana, Ill.

Industrial-Arts Luncheon

Chairman, Mr. Victor Randel, Huntsville, Tex. Toastmaster, Mr. W. T. Bawden, Pittsburg, Kans.

Wednesday, December 2

Industrial Education

Panel discussion. Chairman, Mr. Frank Cushman, Washington, D. C.

Wednesday, December 2

Industrial-Education Teacher Trainers

Chairman, Mr. G. G. Weaver, New York, N. Y. *Inducing Industry to Undertake Training Program,* Mr. N. B. Giles, Washington, D. C.; *Content and Plan of Teacher-Training Course,* Mr. Earl W. Barnhart, Washington, D. C.; *George-Deen Act and Teacher-Training Program,* Mr. C. A. Prosser, Dunwoody Institute, Minneapolis, Minn.; *Neglected Needs in Teacher Training,* Mr. Arthur B. Mays, Urbana, Ill.

Thursday, December 3

Chairman, Mr. F. J. Jeffrey, St. Louis, Mo. Topic: *New Developments in Industrial Education. Training for Operation of Diesel Engine,* Mr. E. F. Riley, Wahpeton, N. Dak.; *Advanced Methods in Home Construction and Their Significance,* Mr. Frank Watson, West Lafayette, Ind.; *What Air Conditioning Means for Industrial Education,* Mr. A. J. Rummel, San Antonio, Tex.; *Developing Training Program for Fire Fighters,* Mr. Horatio Bond, Boston, Mass.

Friday, December 4

Chairman, Mr. Frank L. Beals, Chicago, Ill. Topic: *Selecting and Training the Employee. How Public Education and Industry Supplement Each Other,* Mr. C. A. Johnson, Houston, Tex.; *The Vocational Training of the Employer and the Public School,* Mr. A. C. Horrocks, Akron, Ohio; *Training Oil Field Workers,* Mr. Joe Risinger, Dallas, Tex.; *Selecting and Training Cadets for the Air Service,* Mr. H. W. Harms, San Antonio, Tex.; *New Developments in the Psychotechnique of Selecting and Training,* Mr. Hartman Dignowity, Houston, Tex.

Industrial Arts and Trade and Industrial Education

Chairman, Mr. Paul L. Cressman, Harrisburg, Pa. Topic: *The Future Craftsmen of America Program. Presentation of the Problem,* Mr. Edwin E. Gunn, Jr., Madison, Wis. Discussion, chairman, Irvin S. Noall, Salt Lake City, Utah.

Chairman, Mrs. Anna L. Burdick, Washington, D. C. Topic: *Vocational Training for Wage-Earning Girls and Women.* Discussion leader, Miss Cleo Murtland, Ann Arbor, Mich.

Thursday, December 3

Part-Time Education

Chairman, Mr. E. E. Gunn, Jr., Madison, Wis. Topic: *Apprentice Training. The National Plan for Apprenticeship,* Mr. Felix Wahrmund, San Antonio, Tex.; *The Increasing Need for Apprenticeship,* Mr. Lawson Wimberly, Austin, Tex.; *The Apprentice Reappears,* Mr. W. F. Patterson, Washington, D. C.

Friday, December 4

Chairman, Mr. H. A. Tiemann, Denver, Colo. Topic: *American Youth and the Part-time School.*

Chairman, Mr. C. M. Miller, Topeka, Kans. Topic: *The Scope of Part-time Education. Promotion and Organization of Part-time Classes,* Mr. John Tepoorten, Madison, Wis.; *Part-time Education in Diversified Occupations,* Mr. Paschal Buckner, Big Springs, Tex.; *Part-time Education in Distributive Occupations,* Mr. Earl W. Barnhart, Washington, D. C.; *Training for Leadership and Teaching in Part-Time Education,* Mr. M. D. Broadfoot, Jackson, Miss.

Saturday, December 5

Part-Time Education and Industrial Education

Chairman, Mr. E. E. Gunn, Jr., Madison, Wis. *Organized Labor's Function in Vocational Training,* Mr. Spencer Miller, New York, N. Y.; *Impressions of European Apprenticeship,* Mr. W. F. Patterson, Washington, D. C.

EXHIBITORS AT THE A. V. A. CONVENTION

The American Vocational Association has announced the list of exhibitors who will have displays of their products at the Annual Convention, to be held December 2 to 5, in San Antonio, Tex. The following firms have made reservations:

Alamo Iron Works, San Antonio, Tex.
Allyn & Bacon, Dallas, Tex.
American Technical Society, Chicago, Ill.
American Type Founders Sales Corporation, Elizabeth, N. J.
Brodhead-Garrett Company, Cleveland, Ohio.
Bruce Publishing Company, Milwaukee, Wis.
Carborundum Company, Niagara Falls, N. Y.
Delta Mfg. Company, Milwaukee, Wis.
Egner Brothers, Houston, Tex.
Eugene Dietzgen Company, Chicago, Ill.
International Textbook Company, Scranton, Pa.
Lippincott Company, Dallas, Tex.
Lufkin Rule Company, Saginaw, Mich.
Manual Arts Press, Peoria, Ill.
Maverick-Clarke Litho Co., San Antonio, Tex.
McGraw-Hill Book Co., Inc., New York, N. Y.
McKnight & McKnight, Bloomington, Ill.
National Occupational Conference, New York, N. Y.
Oliver Machinery Company, Grand Rapids, Mich.
Porter-Cable Machine Co., Syracuse, N. Y.
Post Company, Chicago, Ill.
Singer Sewing Machine Co., Dallas, Tex.
South Bend Lathe Works, South Bend, Ind.
Stanley Rule & Level Company, New Britain, Conn.
Starrett Company, Athol, Mass.
Steck Company, Austin, Tex.
United States Blue Print Paper Co., Chicago, Ill.
Walker-Turner Company, Inc., Plainfield, N. J.
Wallace Company, Chicago, Ill.
Yates-American Machine Co., Beloit, Wis.

NEBRASKA INDUSTRIAL-ARTS TEACHERS

The Nebraska Industrial-Arts Teachers' Association has made great strides since 1934, under the leadership of its officers and trustees. The objectives set up by the members for this organization follow:

A. To promote a greater interest in industrial arts among educators of the state.

B. To attempt to set up and agree on

standards of attainments in the different industrial-arts fields in the state.

C. To develop a new state course of study for industrial arts.

D. To create an interest among industrial-arts teachers in professional development and provide a situation for the exchange of professional ideas.

E. To develop a program of safety through a knowledge of good technique and practices in industrial-arts and industrial enterprises.

F. To assist in such state and national legislation as seems desirable for the promotion of industrial arts and vocational education.

G. To promote the development of the craftsmanship and leisure-time movement in the State of Nebraska.

H. To develop a closer relation between our state organizations and our national American Vocational Association.

In accordance with objective C, "To develop a new state course of study for industrial arts," the association has appointed a number of committees who are at present working on plans for the new state course. Besides the editing, objectives, content, and method committees, groups are engaged upon planning courses of work in general shop, auto mechanics, forging and machine shop, electricity, sheet and bench metal, architectural drafting, mechanical drawing, woodworking, agricultural work, carpentry, printing, and safety.

VOCATIONAL AND INDUSTRIAL-ARTS CONFERENCE

The Vocational and Industrial-Arts Conference held its meeting October 16 to 17, at the Carnegie Union, in Pittsburgh, Pa. A joint meeting of the vocational and character-education groups was held on Friday morning. Dr. A. B. Mays, of the University of Illinois, opened the session with a talk on "Moral Factors in Industrial Education," in which he reviewed the history of industrial progress. A discussion on moral education followed, led by Dr. S. P. Franklin, of the University of Pittsburgh. Others taking part in the discussion were Dr. Connelley and Dr. Cleeton of Carnegie Institute of Technology.

The meeting on Saturday morning was devoted to trade and industry. It was led by Mr. A. J. Glynn, of the Connelley Trade School. Mr. H. E. Wood, of Indianapolis, Ind., gave an illustrated talk on "Drawing Made Easy for Industrial Arts," in which he stressed the need of short cuts in teaching design and the necessity of becoming a good designer. Dr. W. B. Jones, of the State Department of Education, led the discussion.

Mr. S. L. Coover, secretary of the association, reported the largest enrollment on record in the organization and urged all of the members to attend the meeting in December, at Harrisburg.—*G. C. Donson.*

MEETING OF AMERICAN COUNCIL ON GUIDANCE

The annual meeting of the American Council on Guidance and Personnel Associations will be held February 17 to 20, in New Orleans, La. The association will take up "Critical Issues in Guidance and Personnel Work" pertaining to the personal adjustment problems of individuals, and there will be a panel discussion of the problems of youth. The college personnel group will discuss accomplishments in college personnel work in the direction of counseling, placement, and research.

INTERNATIONAL CONGRESS OF TECHNICAL EDUCATION TO MEET IN ROME

The International Congress of Technical Education will be held on December 28 to 30, in Rome, Italy. The five topics, "Technical Education and Economic Life," "Vocational Guidance and Follow-up Work," "Training for Shop Instructors," "Training of Women for Economic Life," and "The Technical Press and Technical Education," will be the subjects for discussion.

Information concerning the congress may be had by writing to the International Bureau of Technical Education, 2 Place de la Bourse, Paris, France.

News Notes

Announce School of Vocational Education

The Louisiana State University of Baton Rouge, La., has announced the establishment of a school of vocational education, in charge of Dr. R. L. Davenport. In this school the departments of agricultural education, home-economics education, and industrial education have been concentrated.

A department of industrial education has been placed in charge of Mr. Kenneth Beach. This department offers courses toward a bachelor of science degree in both the fields of trade and industrial education and industrial arts. Beginning with the summer session of 1937, the department will offer work leading to the master's degree. The arrangement provides an opportunity for persons employed in industrial education to pursue graduate work during the summer session and to obtain the master's degree in this field.

Announce Annual Contest

The International Business Machines, Inc., New York City, has announced its third annual national contest for high-school students in creative writing. The contest is open to junior- and senior-high-school students in private, parochial, and public high schools of the country, and the winner will be given a four-year university tuition scholarship at a college of the winner's choice. A total of 52 awards will be given to state and territorial winners and 52 awards to the schools attended by them. The school of the national winner will also receive an award. The subject for the contest is "Today's Need for Thoughtful Effort." The contest closes March 30, 1937.

Announce Student Essay Contest on Color

The International Printing Ink Corporation, 75 Varick St., New York City, in co-operation with the National Graphic Arts Education Guild, is sponsoring an essay contest on color, which is open to all students in high schools and trade schools throughout the country.

The competition is the third step in the Association's program of color education. Students are asked to write a 600-word essay on the subject, "The Importance of Color in Printing."

The Association is offering a number of prizes, which are divided into two groups, local and national. In each school participating in the contest, three sets of books on "Color" will be awarded to the authors of the three best essays. One best paper from each of the schools will be forwarded to the National Graphic Arts Education Guild in Washington, to be submitted in a national competition.

The winners will be selected by a group of judges, headed by Henry L. Gage, vice-president of the Mergenthaler Linotype Company. The winners will be announced during National Printing Week, January 15 to 22. The national winner will be awarded a $400 scholarship to the Carnegie School of Printing and a trip to New York City.

Personal News

F. C. WHITCOMB HONORED

F. C. Whitcomb, director of the division of practical arts of the School of Education, Miami University, Oxford, Ohio, was granted the honorary degree of doctor of laws at the 1936 commencement exercises of Franklin College, his Alma Mater. The degree was awarded in view of Doctor Whitcomb's 32 years of service in the university and college field of practical arts, and in recognition of his administrative and organization ability which he has shown during those years.

AWARDED DOCTOR OF PHILOSOPHY DEGREE

Prof. Oscar Ray LeBeau, a member of the staff of Hampton Institute, Virginia, has been awarded the doctor of philosophy degree by Cornell University.

While pursuing his doctorate, Professor Le Beau majored in agricultural education, rural secondary education, and rural social organization.

MR. GRENIER TAKES NEW POSITION

Mr. Leo Grenier has been appointed instructor in machine-shop practice in the Cole Trade School, in Southbridge, Mass. Mr. Grenier, formerly was employed by the American Optical Company.

Mr. Richard Shaver has recently been elected supervisor of industrial arts in the junior and senior high schools of Saranac Lake, N. Y.

Mr. John E. Crawford is teaching electricity in the industrial-arts shop of the Perry High School, Pittsburgh, Pa.

New Publications

Factory Equipment

By Joseph W. Roe and Charles W. Lyttle. Imitation leather, 517 pages, 5½ by 8½, illustrated. Price, $4. Published by International Textbook Company, Scranton, Pa.

A book specifically designed for the engineer who must know production machinery and, therefore, an excellent text for engineering schools. Nevertheless, it is also of greatest value to the shop teacher in general. Not only does it contain excellent material on the erection and maintenance of industrial shop build-

ings, but it gives also a very fine résumé of the departments which make up an industrial establishment, and contains full descriptions of the functions and organizations of the various departments, the processes which are carried on, and the tools with which they are performed. The table of contents gives a good idea of how the subject is handled: Building and Manufacturing; The Drafting Department; Patternmaking and Woodworking; Smelting and Remelting; Metals Used in Industry; Foundry Molding; Hand and Power Forging; Die Forging and Casting; Pressing, Stamping and Spinning; Welding, Soldering, and Brazing; Heat Treating; The Toolroom — Gauges and Inspection; Tools for Cutting Metals; Turning: Engine Lathes; Turning: Turret and Automatic Lathes; Boring Mills and Boring Machines; Drilling; Planing, Shaping, Slotting and Broaching; Milling; Gear Cutting; Screw-Thread Cutting; Grinding; Selecting Equipment; Designing Jigs and Fixtures; Materials Handling; General Effects on Steel of Alloying Elements; Classification of Stainless Steels; Designation of Steel and Aluminum Alloys; General Information on the Feeds and Speeds for Various Milling Machines; and Use of Inspection Trips as Supplement to Course.

An Introduction to Architectural Drawing

By Wooster Bard Field. Cloth, 103 pages, 9⅛ by 12¼, illustrated. Price, $2.50. Published by The McGraw-Hill Book Co., New York City.

A concise yet inclusive treatment of the subject. The illustrations showing pencil rendering are superb.

Workshop Receipts

Cloth, 5 by 7⅜, 544 pages, illustrated. Price, $2.50. Published by the Chemical Publishing Company, New York City.

This is one of five volumes now obtainable. Each volume contains thousands of receipts and formulas of value to engineers, scientists, manufacturers, home experimenters, farmers, mechanics, and home owners.

Airplane and Its Engine

By C. H. Chatfield, C. Fayette Taylor, and Shatswell Ober. Cloth, 401 pages, 5¾ by 8¼, illustrated. Price, $3. Published by the McGraw-Hill Book Co., New York City.

This is the third edition of a book that has found quite an acceptance in the field of aeronautics. The book has been brought up-to-date. Parts of it have been clarified and amplified and descriptions and illustrations of the latest type of airplane engines have been added.

Airplane Conditioning — Design and Construction of Ducts

By Thomas J. Brett. Cloth, 226 pages, 5¾ by 8½, illustrated. Published by the American Technical Society, Chicago, Ill.

This book treats a subject which is becoming increasingly important. It is divided into the following chapters: Duct Requirements for Air-Conditioning Systems, Calculations for Duct Design and Construction, Inlet and Exit Duct Openings, Air Recirculation, Installation of Ducts, Material and Construction, Insulation and Operation of Ducts, Air Distribution, Formulas, Air Ducts for Typical Buildings, Air Ducts for Transportation Service for Railroads, Friction Chart.

Illustrative problems are presented where necessary. Questions for the student are introduced in the same way. Of special help to the mechanic or student who is studying the material without a teacher are the answers to questions showing, not only answers, but how to work out the solutions to the problems given.

Color in Sketching and Rendering

By Authur L. Guptill. Cloth, 365 pages, 9 by 11¼, illustrated. Price, $10. Published by Reinhold Publishing Corporation, New York City.

This well-known author has made the present volume a fit companion to his other books *Sketching and Rendering in Penciling* and *Drawing with Pen and Ink*. The subject is exhaustively treated, and there are many excellent examples (195 plates) in color to set a mark for the student to shoot at.

How to Draw with Pen, Brush, and Ink

Cloth, 64 pages, 5⅝ by 9, illustrated. Price, $1. Published by Bridgman Publishers, Inc., Pelham, N. Y.

This interesting little book shows reproductions of 49 prize-winning drawings and others of the Scholastic Higgins Award Contest. It presents an interesting study of many different types of techniques.

English for Vocational Schools

By John T. Shuman. Cloth, 365 pages, 5⅜ by 8¼, illustrated. Price, $2.40. Published by The Ronald Press Company, New York City.

An excellent text for those preparing to enter industry. It shows many practical applications of English to life situations which the worker must be prepared to meet.

Carpentry and Joinery Work

By Nelson L. Burbank. Cloth, 280 pages, 8¾ by 11¼, illustrated. Price, $3; paper, $2.50. Published by Simmons-Boardman Publishing Company, New York City.

This planographed book gives a concise but very complete description of the tools and the jobs with and at which the carpenter works. Full instructions are given for the reading of the plan to the making of the excavations, laying the foundations, erecting the skeleton, and putting on the exterior and interior finish.

Miniature Racing Yachts

By Thomas Darling. Cloth, 118 pages, 13¼ by 9½, illustrated. Price, $5. Published by Charles Scribner's Sons, New York City.

Starting out with a description of the types of boats that can be used for miniature yacht races, the author describes the making of the hull, the method of ballasting, and the making of the spars, fittings, steering gears, and sails. There is also a chapter on how to make the calculations required when designing miniature yachts, rules on racing the models, and directions for tuning up and sailing.

School-Shop Equipment News

NEW O.K. LIGHT TYPE

The O.K. Light Type Foundry, 910 W. Van Buren St., Chicago, Ill., is marketing a new line of O.K. light display type which is made in sizes 42 to 144 point. It is especially effective for many school jobs. Because of its novel construction which eliminates all waste metal, 50 lbs. of this type are equivalent in characters to about 300 lb. of foundry type.

O.K. light type is cast with a strong metal base in the center of each character. Special metal furniture is placed top and bottom to render rigid support. The face of O.K. light type is mechanically surfaced to a smooth, glasslike finish. It is exceptionally hard and is said to outlast solid type three to four times.

This type is now available in Bodoni, Bodoni bold, Bodoni bold italic, poster Bodoni Garamond bold, Memphis bold, Memphis extra bold, Gothic condensed No. 13, and

Gothic No. 16. Other faces are coming out in the near future.

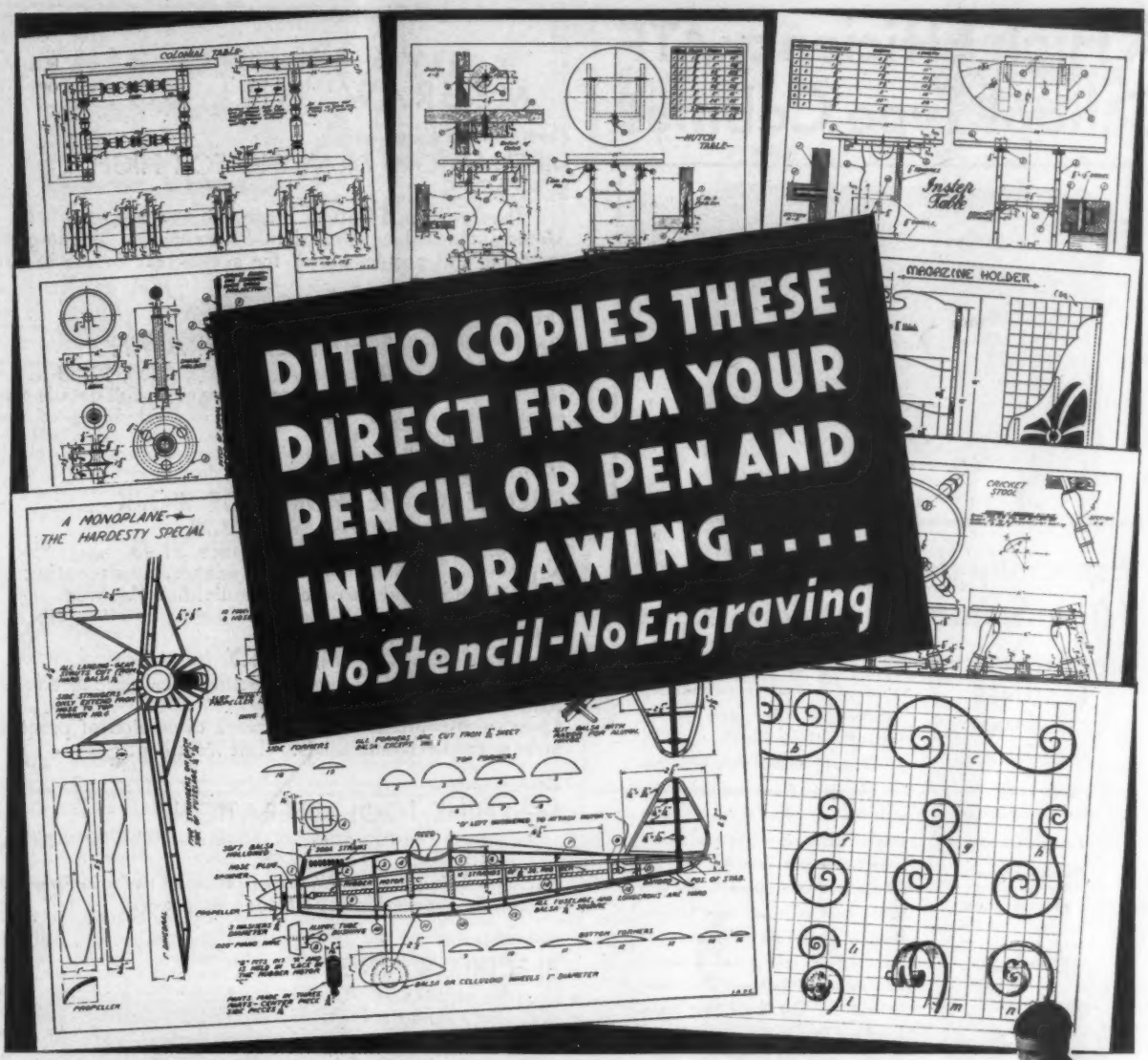
Complete information about this novel type is available upon request.

A HANDY STEEL-WOOL HOLDER

Landon P. Smith, Inc., Irvington, N. J., manufacturers of Red Devil glass cutters, have announced the production of a new steel-wool holder, designed especially for a new handy-size steel-wool roll, but is also usable for any reasonably sized piece of steel wool. The wool is inserted in the holder by simply

bending the sides and clamping in the wool. The holder, made of rubber, is practically indestructible, and can be used on either wet or dry work.

The device has been accepted by many painters as a protection for the hands and is a welcome addition to the working outfit.



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The cost of making Ditto copies is less than 5 cents per hundred, and it is proportionately lower for less than 100 copies. Vocational schools and vocational departments of elementary and high schools find Ditto indispensable for their needs—saving time, labor and many dollars in the course of a school year. *We shall be glad to send you without cost or obligation samples showing just what Ditto can do for you. Simply return the coupon attached.*

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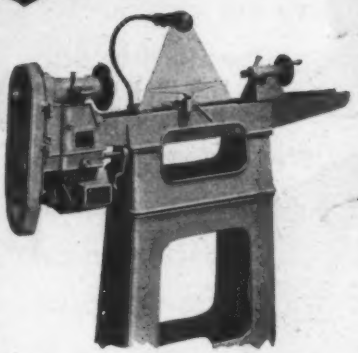

See this machine at the San Antonio Convention— Dec. 2nd-5th.

The latest in Lathe equipment—the new Wallace No. 46 Multi-Speed Lathe. This machine operates on an entirely new principle in belt drives, insuring full and complete power transmission. Unusual swivelling headstock permits face plate turning up to 30" in diameter. Machine has nine speeds, from 550 to 2400 r.p.m.,—others available from 250 to 3600 r.p.m.

The Wallace No. 46 Multi-Speed Lathe will be exhibited at the A. V. A. Convention, San Antonio, Dec. 2-5th. We invite you to visit our booth and see this new and modern machine, also our High-Speed Jointer, Shaper, Band Saw, and Universal Saw.

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A NEW UNIVERSAL WHEEL PULLER

Snap-On Tools, Inc., Kenosha, Wis., has announced a new No. Y-4567 Blue-Point Universal Wheel Puller. This is an exceedingly efficient tool and is equipped with demountable-wheel hubs, to make it adaptable to all passenger cars and light trucks.

The new wheel puller can be quickly adapted to any wheel on present-day and future cars by inserting the proper type of jaws and attaching the tool to the stud bolts. Single-purpose wheel pullers, therefore, are no longer needed as this one wheel puller will take care of all of the wheel-pulling jobs that may come up.

The jaws slide around to any desired position on the housing and pivot on an inner flange to swing to any required bolt-circle diameter. The pull is then directly from the flange, thus providing a direct pull from the housing, regardless of the angle at which the jaws are set. The bottoms of the jaws are shaped to fit the hub properly from any angle and the stud holes are machined so as to eliminate all danger of bending the stud bolt.

This universal puller has a unique self-aligning feature which assures perfect alignment automatically so that the power is applied evenly to all parts of the hub. A few hammer blows on the drive handle exert a gradual but powerful pressure which will remove the tightest hub without injury to the differential or any other part.

NEW TOOL-SHARPENING DEVICE

Teachers of industrial arts and vocational education will be interested in the new patented tool-holding device for sharpening small tools — the Chartier tool holder which is manufactured by the Chartier Company, 7312 Bennet Avenue, Chicago, Ill.

This tool holder can be attached to any bench or large grinder and makes it possible for students expertly to sharpen small tools without "burning." A number of these units can be installed in a shop so that groups of students may be taught to sharpen twist-drill bits, plane irons, metal-lathe cutters, skew chisels, gouges, knives, and scissors.

The Chartier tool-sharpening device saves valuable time for the instructor and is an important factor in reducing damage to tools by inexperienced workers.

OFFER NEW BOOK ON ABRASIVES

The Norton Company, Worcester, Mass., manufacturers of grinding wheels and machines, has just issued a 79-page book, containing a course of lectures on "Abrasives and Grinding."

The book has been prepared in response to a demand for this kind of material. The lectures cover general information on the history and development of grinding, natural abrasives, manufacture of artificial abrasives, characteristics of grinding wheels, fundamental principles used in practice, and practical methods employed in grinding. Each lecture contains not only the fundamentals that the student should know, but also a list of questions for testing his knowledge.

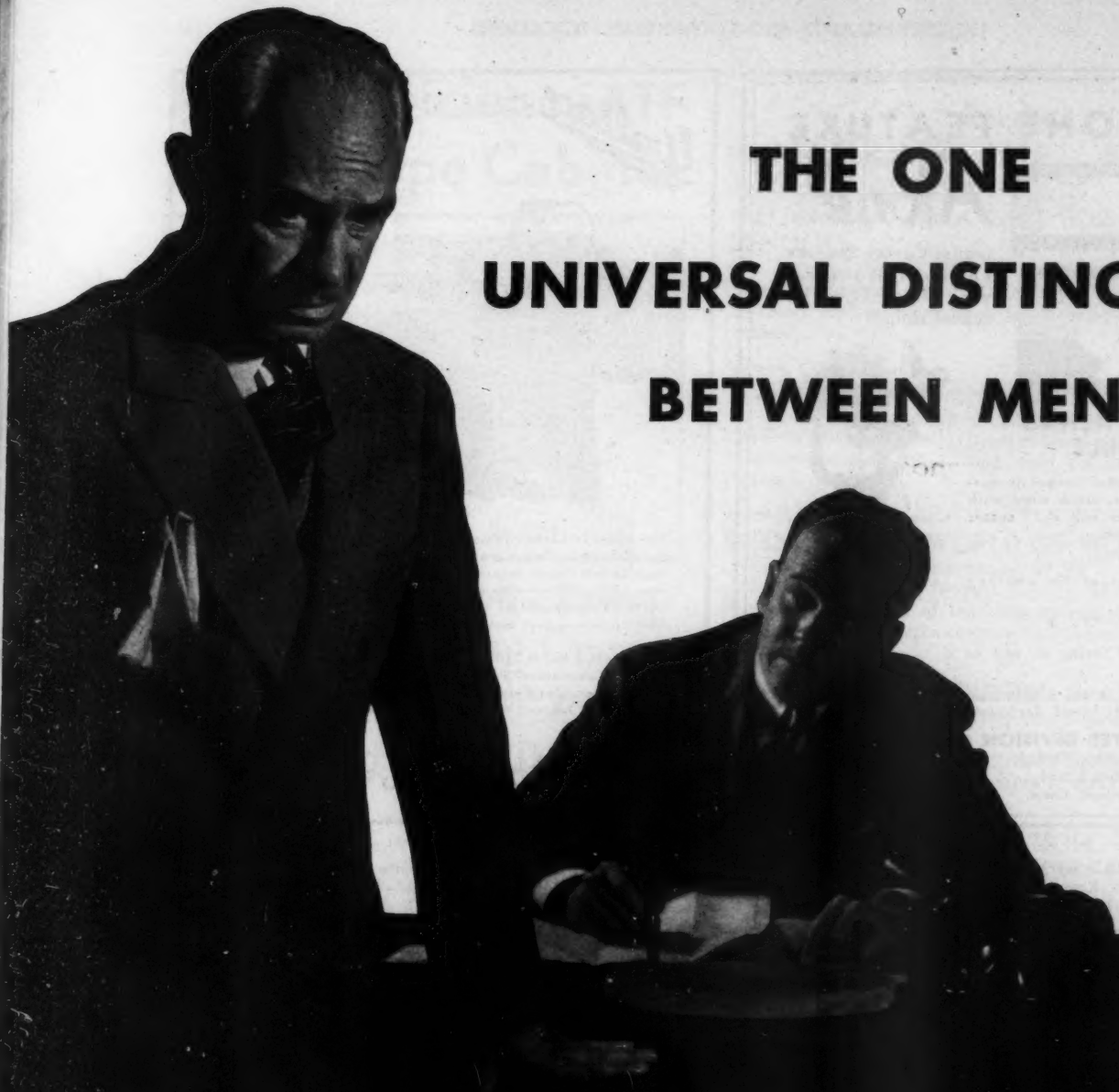
The book contains ten lectures. It will be found very helpful by instructors of the school shop.

MR. CHAPIN RECEIVES AWARD

Mr. W. R. Chapin, a research director for the E. C. Atkins Company, Indianapolis, Ind., was recently honored by the American Society for Metals with the Sauveur Award, the highest honor of the association.

The award which is a rare and distinct honor, was given in recognition of Mr. Chapin's fundamental work in connection with the two-stage quenching of steel, which has explained many mysteries of heat-treatment results, has stimulated and guided many important researches, and has led to the clarification of theory, and introduced economy in many practices of steel treating.

Mr. Chapin, who was born in Bellows Falls, Vt., was educated in the Alabama State Normal College and the University of Alabama, where he specialized in chemistry. His knowledge and ingenuity have helped the steel industry and steel fabricators to save hundreds of thousands of dollars.



THE ONE UNIVERSAL DISTINCTION BETWEEN MEN

According to psychologists, there is a distinct "Failure" personality. It reveals itself in faulty viewpoint, thinking and standards.

If there is one distinction between men which is universally recognized, in Halls of Learning as well as in Commerce and in the Sciences, it is the distinction between success and failure. Probably because at bottom, the difference is one of personality rather than one of learning, bank account or fame.

In point of fact, psychologists recognize a manifest Failure Personality. It reveals itself in faulty viewpoint, defective and misdirected thinking, and a lack of sure standards and ideals.

Every educator worthy of the name exhibits growing concern with this aspect of his profession. No matter what the aptitudes or ambitions of the lads in his care, he knows the necessity to instill in them a feeling for true craftsmanship, the ability to discern between the good and the shoddy, an unfailing reverence for ideals.

Probably the greatest and certainly one of the best opportunities presents itself in connection with each boy's drawing set. Drawing instruments are usually the first fine tools to come into his hands; the first personal possession uniquely adapted to the development of his creative ability; the first step in the disciplines of careful workmanship, precise thinking and persistence toward a goal. When the instructor shows genuine concern in their accuracy, in their quality . . . *in the maker's name* on the instruments his pupils use, he is setting an example whose influence will reach far into the future. A true educator grasps this golden opportunity to mold character—to build better men for a better world.

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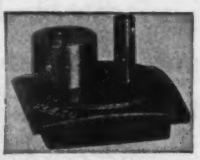

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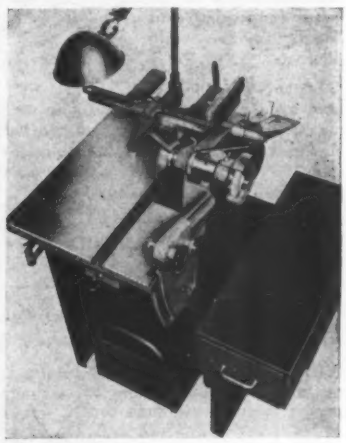

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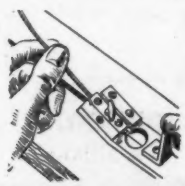

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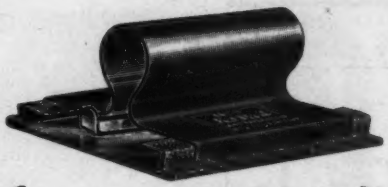

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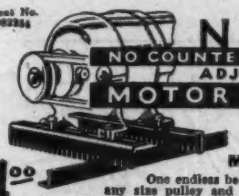

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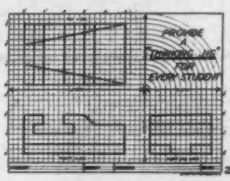

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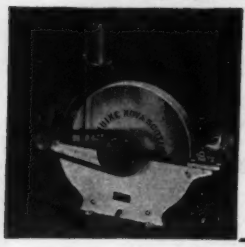

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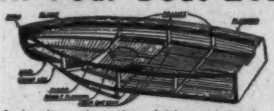

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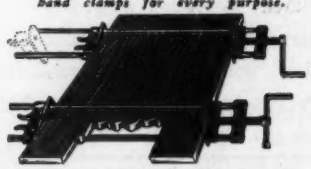

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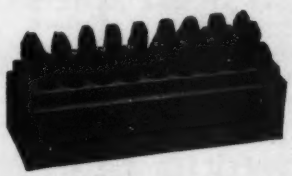

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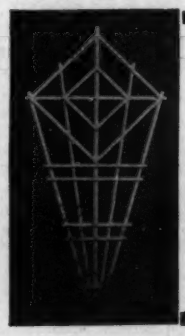

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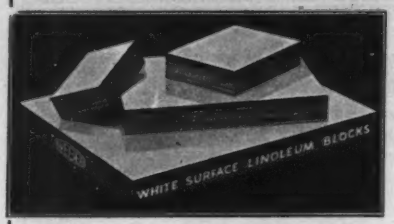

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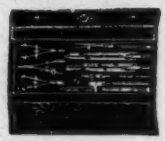

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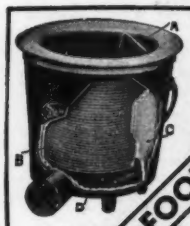

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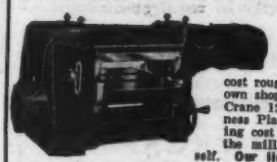

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